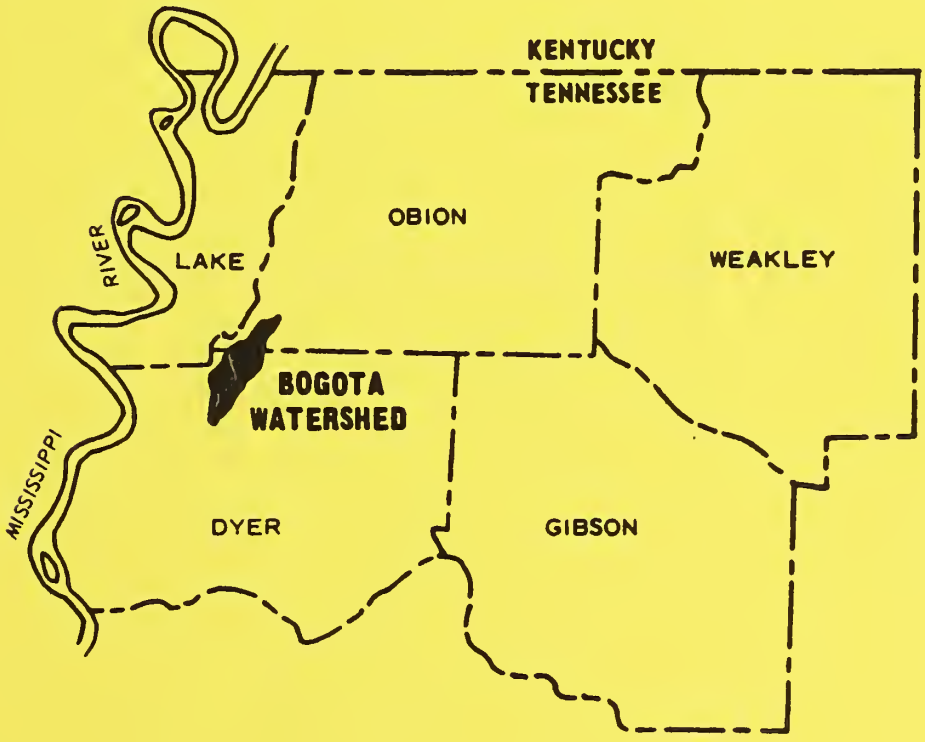
WATERSHED WORK PLAN

BOGOTA WATERSHED

DYER AND OBION COUNTIES,

TENNESSEE



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
AND
FOREST SERVICE

4-29275 4-70

ADDENDUM
BOGOTA WATERSHED, TENNESSEE

The purpose of this addendum is to include in the work plan certain requirements of the Principles and Standards which are: Part I - Benefit to cost comparisons; Part II - Abbreviated four acount displays; and Part III - Abbreviated environmental quality plan.

Part 1

This addendum shows the project cost, benefits, and benefit-cost ratio based on a 5-7/8 percent interest rate, current normalized prices and the 1974 price base. Annual project costs, benefits, and benefit-cost ratio are as follows:

1.	Project costs are	$ 34,782
2.	Project benefits are	105,990
3.	The project benefit-cost ratio is	3.0:1.0

February 1975

WATERSHED WORK PLAN AGREEMENT

between the

Bogota Drainage District

Dyer County Soil Conservation District

Obion County Soil Conservation District

(hereinafter referred to as the Sponsoring Local Organization)

State of Tennessee

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organization for assistance in preparing a plan for works of improvement for the Bogota Watershed, State of Tennessee, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organization and the Service a mutually satisfactory plan for works of improvement for the Bogota Watershed, State of Tennessee, hereinafter referred to as the watershed work plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organization and the Secretary of Agriculture, through the Service, hereby agree on the watershed work plan, and further agree that the works of improvement as set forth in said plan can be installed in about 3 years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the watershed work plan:

1. The Sponsoring Local Organization will acquire such land rights as will be needed in connection with the works of improvement. (Estimated cost $82,000).

2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	Sponsoring Local Organization (percent)	Service (percent)	Estimated Relocation Payment Costs (dollars)
Relocation Payments	47	53	0 1/

1/ Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business or farm operation. However, if relocations become necessary, relocation payments will be cost-shared in accordance with the percentages shown.

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of the works of improvement.

4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Construction Cost (dollars)
Channel Work	0.0	100.0	247,000

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

Works of Improvement	Sponsoring Local Organization (percent)	Service (percent)	Estimated Engineering Cost (dollars)
Channel Work	0.0	100.0	49,400

6. The Sponsoring Local Organization and the Service will each bear the costs of project administration which it incurs, estimated to be $18,000 and $30,000 respectively.

7. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.

8. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

9. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

11. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

    A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated, only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.

13. No member of or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964 and the regulations of the Secretary of Agriculture (7 C.F.R. Sec. 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving federal financial assistance.

15. This agreement will not become effective until the Service has issued a notification of approval and authorizes assistance.

Bogota Drainage District
Local Organization

By J C Stutts

Dyersburg, TN 38024
Address Zip Code

Title Chairman

Date 5-19-75

The signing of this agreement was authorized by a resolution of the governing body of the Bogota Drainage District
Local Organization
adopted at a meeting held on 5-19-75

W. A. Mayes
Secretary, Local Organization

Dyersburg, TN 38024
Address Zip Code

Date 5-19-75

Dyer County Soil Conservation Dist.
Local Organization

By James Reasons

Finley, TN 38030
Address Zip Code

Title Vice-Chairman

Date 5-19-75

The signing of this agreement was authorized by a resolution of the governing body of the Dyer County Soil Conservation District
Local Organization
adopted at a meeting held on 5-19-75

L. W. Austin
Secretary, Local Organization

Newbern, TN 39059
Address Zip Code

Date 5-19-75

Obion County Soil Conservation Dist.
Local Organization

By Herbert Barber

Rt. 2 Hickman, Ky. 42050
Address Zip Code

Title Chairman

Date 4-29-75

The signing of this agreement was authorized by a resolution of the governing body of the Obion County Soil Conservation District
Local Organization
adopted at a meeting held on 4-29-75

Secretary, Local Organization

Rt. 1 Troy, Tenn. 38260
Address Zip Code

Date 4-29-75

Appropriate and careful consideration has been given to the environmental statement prepared for this project and to the environmental aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

Donald C. Burns
State Conservationist

May 23, 1975
Date

PART II
SELECTED PLAN
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT
BOGOTA WATERSHED, TENNESSEE

Components	Measure of effects 1/
Beneficial effects:	
A. The value to users of increased outputs of goods and services	
1. Flood prevention	$96,715
Total beneficial effects	$96,715

Components	
Adverse effects:	
A. The value of resources required for plan	
1. 29.2 miles of stream channel work	
a. Project installation	$22,757
b. Project administration	2,887
c. Operation and Maintnenace	8,200
Total adverse effects	$33,844
Net beneficial effects	$62,871

1/ Average Annual at 5-5/8 percent for 50 years.

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SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT
BOGOTA WATERSHED
TENNESSEE

Components	Measures of effects
A. Management, protection, enhancement, and creation of areas of natural beauty and human enjoyment.	1. Improving the appearance of water transport system by removing debris discarded by man.
	2. Seeding all channels and banks to avoid the visual degradation of raw-ditch banks.
	3. Eliminating pockets of standing water by land smoothing to lessen the incidence of mosquitoes as a nuisance or possible vector.
B. Management, preservation, creation and enhancement of especially valuable or outstanding biological resources or ecosystems.	1. Continued conversion of upland cropland (150 acres) to grassland or cropland-grassland rotations.
	2. Reforestration of 120 acres of understocked forest stand will improve the plant species diversity on these areas.
	3. Retaining mast-bearing trees in clearing operations for channel construction.
	4. Installing a grade stabilization structure in Daugherty Creek to avoid channel degrading into swamp area.
	5. The loss of 61 acres of trees and shrubs for the channel will be replaced

	with 154 acres of planted wildlife food and cover on the spoil and maintenance area.
	6. The small area of wetland type 6 and 7 will be retained and flooding of wetland type 1 will still occur because the major effect of the project on flooding will be in duration to lessen agricultural damages during the growing season.
C. Improve quality of land, water, and air.	1. Improvement of cover conditions in 420 acres of upland grassland to decrease runoff, erosion, and sediment production.
	2. Stand improvement of 220 acres of forest lands for better hydrologic conditions and wood product production.
	3. Erosion rates from uplands will be decreased by 60 percent and the sediment concentration will be decreased from 143 ppm to 58 ppm.
D. Irreversible or irretrievable commitments of resource.	1. The 77 acres committed to the channel is the extent of irreversible commitments of resources. The remaining land in the easement area will be reestablished in vegetation useful for wildlife habitat.

REGIONAL DEVELOPMENT ACCOUNT
BOGOTA WATERSHED, TENNESSEE

Components	Measures of effects 1/ Region 2/	Rest of Nation
A. Income:		
Beneficial effects:		
1. The value of increased output of goods and services to users residing in this region		
a. Flood prevention	$ 96,715	-
b. Secondary	9,275	-
Total beneficial effects	$105,990	-

Components	Measures of effects 1/ Region 2/	Rest of Nation
A. Income:		
Adverse effects:		
1. The value of resources contributed from within the region to achieve the outputs		
a. 29.2 miles stream channel work		
Project installation (str. measures)	$ 4,932	$17,825
Project Admin.	1,083	1,804
O&M	8,200	-
Total adverse effects	$14,215	19,629
Net beneficial effects	$91,775	-19,629

1/ Average annual at 5-5/8 percent for 50 years.
2/ The region consists of Dyer, Lake and Obion Counties, Tennessee

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REGIONAL DEVELOPMENT ACCOUNT (Continued-2)
BOGOTA WATERSHED, TENNESSEE

Components	Measures of effects: Region 1/	Measures of effects: Rest of Nation
B. Employment:		
Beneficial effects:		
1. Increase in the number and types of jobs		
a. Agricultural employment	5 permanent semi-skilled jobs	-
b. Employment for project construction	60 man-years of semi-skilled employment during installation period (3 years)	-
c. Employment for project operation and maintenance	1 permanent semi-skilled job	-
Total beneficial effects	6 permanent semi-skilled jobs	-
	60 man-years of semi-skilled employment over the installation period (3 years)	-

Components	Measure of effects: Region 1/	Measure of effects: Rest of Nation
B. Employment:		
Adverse effects:		
1. Decrease in number and types of jobs	0	0
Total adverse effects	0	0
Net beneficial effects	6 permanent semi-skilled jobs	-
	60 man-years of semi-skilled employment over the installation period (3 years)	-

1/ The region consists of Dyer, Lake and Obion Counties, Tennessee

REGIONAL DEVELOPMENT ACCOUNT (Continued-3)
BOGOTA WATERSHED, TENNESSEE

Components	Measures of effects	
	Region 1/	Rest of Nation
C. Population Distribution		
Beneficial effects	Create 6 permanent semi-skilled jobs in a rural area and 60 man-years of semi-skilled employment over the installation period (3 years)	-
Adverse effects	-	-
D. Regional Economic Base and Stability		
Beneficial effects	Create 6 permanent semi-skilled jobs and 60 man-years of semi-skilled employment over the installation period (3 years). Reduce flood hazard on about 10,100 acres of flood plain.	-
Adverse effects	-	-

1/ The region consists of Dyer, Lake and Obion Counties, Tennessee

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SOCIAL WELL-BEING ACCOUNT
BOGOTA WATERSHED, TENNESSEE

Components	Measures of effects
A. Real Income Distribution	1. Create 6 permanent semi-skilled jobs and 60 man-years of semi-skilled employment over the installation period (3 years).
	2. Create regional income benefit distribution of $105,990. 1/ Income class distribution (percentage) not available.
	3. Local cost to be borne by region total $14,215. Income class distribution (percentage) not available.
B. Life, health and safety	1. Future threats of loss of life and displacements during floods will be reduced.

1/ The region consists of Dyer, Lake and Obion Counties, Tennessee.

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Part III

BOGOTA WATERSHED
DYER AND OBION COUNTIES, TENNESSEE

ENVIRONMENTAL QUALITY PLAN
(Abbreviated)

I. Environmental Quality Problems

A. Natural Beauty

The upland portion of this project area is steeply rolling landscape with narrow ridges, steep-sided draws, and narrow valley floors. One-third of the area is in forests, with the remainder in grass, native vegetation, reclaimed idle land, and cropland. Beauty is marred by the sight of crops on land too steep to be farmed, idle land not completely healed from past severe erosion, overgrazed pastures, and some abused forest lands. The roadsides are marred by some raw banks and normal roadside litter.

The flood plain has changed to the homogeneous landscape of monocultural cropping. There is a noticeable absence of fencerows, or tree and bush-studded field boundaries to provide a diversity in the flat landscape. Wooded areas are on the decrease. Drainageways that are grown up in trees and shrubs afford the predominate visual break in the view and these have an incidental use as an area for disposing of junk.

B. Biological resources and ecosystems

Absence of plant community diversity in the flood plain of this project area is one important factor causing the lack of wildlife resources. The trend of additional forest land clearing compounds the problem. The absence of fencerows and field boundaries of shrubs and trees eliminates the cover essential for many wildlife species to utilize the extensive cropland areas.

C. Quality of water, land, and air

The only significant perennial sources of surface water in the area are the six farm ponds in the uplands and the small swamp area in the flood plain. The stream flow is ephemeral, thus the flowing water when it occurs will be turbid with suspended colloids.

The soils of the upland are highly erosive if not protected with vegetation. Inherent fertility is high so establishing and maintaining vegetation is not a major problem. The problem is adjusting man's activities to the capability of the soils.

II. Description of the Proposed Plan

A. Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment.

1. Establish a community disposal area for discarded junk now found in waterways and along road sides. Establish a living screen around the disposal area with wildlife food-producing plants. The cost is estimated to be about $3,000.

2. Clear abandoned homesteads of dilapidated buildings at an estimated cost of $5,000.

3. Establish about 10 miles of living property boundaries with shrubs and trees that will also provide food and/or cover for wildlife at an estimated cost of about $5,000.

B. Management, preservation, creation or enhancement of valuable or outstanding biological resources.

1. Construct a multi-purpose reservoir in Daugherty Creek with the permanent pool surface area of about 115 acres which would make a manageable body of water for fish production with a surface area to drainage area ratio of 1:9.9. Public access should be assured and the recreation potential should be developed. The cost is estimated to be about $500,000.

2. Establish living fencerows around the 810 acres of grassland at a cost of about $5,000.

3. Fence the six existing farm ponds and install livestock watering facilities. The area between the fence and the water should be established in wildlife food and cover. The cost is estimated to be about $6,000.

4. Discourage clearing of present forest lands on capability class IIIw lands. Reestablish forests on about 3,000 acres of capability class IIIw lands already cleared that are not feasible to farm with the present flooding and drainage systems at a cost of about $180,000.

5. Construct 10 additional ponds for livestock water and grazing distribution plus sediment control. Ponds should be fenced and area in between be established in wildlife food and cover. The cost is estimated to be about $12,000.

6. Construct low levees equipped with water level control structures around about 900 acres of existing class IIIw forest lands, and manage areas for waterfowl hunting. Provide for public access. The cost is estimated to be about $108,000.

7. Construct levees equipped with water level control structures in suitable areas (about 3,000 acres) of class IIIw (heavy clay) and manage the area for commercial fish production in rotation with rice. Waterfowl hunting privileges can be leased to supplement monetary return. The cost is estimated to be about $900,000.

8. Establish wildlife food and cover areas in odd areas and corners of fields (about 30 acres) that are inaccessible and not practical to reach with farm machinery at a cost of about $18,000.

C. Enhancement of quality aspects of water, land, and air.

1. Establish perennial vegetation on all exposed soil areas (about 5 miles) that are not being used for farming, such as roadsides, idle gullied areas, drainage ditch banks and waterways at an estimated cost of about $16,000.

2. Control erosion in uplands by making required land use adjustment according to capability of soils or use grass based rotations with needed supporting conservation practices to reduce soil losses to allowable limits.

The total estimated cost of establishing the environmental quality plan, including contingencies, is about $2,000,000.

III. Description of the Environmental Effects

A. Natural Beauty

1. The general appearance of the area will be improved by the disappearance of discarded junk along roadways and in stream channels. A living screen will surround the disposal area to enhance the appearance.

2. The landscape of the flood plain will be changed by the emergence of trees and shrubs to break the visual continuity of dominant croplands.

3. The removal of dilapidated buildings will improve the appearance of the countryside landscape. Visual quality will be enhanced.

B. Biological resources and ecosystems

1. The multiple-purpose reservoir would add 115 surface acres of water to the area that would have a potential of 11,500 man/day of recreational fishing. It would also provide additional habitat for waterfowl and other water-related wildlife. Potential for other recreational activities would be present. The reservoir would also trap sediment and have some flood prevention capabilities plus scenic values.

2. In addition to scenic break in the landscape and wildlife habitat, the living property boundaries and live fencerows around pastures would also provide a barrier to the habitat of cropland insect pests and would harbor beneficial insects and birds that are parasitic on cropland related insects.

3. The 10 new fenced ponds plus fencing of the six existing ponds would provide additional upland and water-related wildlife habitat to the area and additional recreation fishing and hunting opportunities.

4. Reestablishing 3,000 acres of forest land on the capability class IIIw lands would add to the woodland wildlife and wetland wildlife habitat. Wood products would be produced on these acres of good forest site index.

5. The 900 acres of present forest land to be leveed would provide not only wood products but also paid waterfowl hunting opportunities.

6. The 3,000 acres of capability class IIIw (heavy clay) that would be leveed would provide two additional food crops (rice and fish) for the area. In addition, there would be about 3,000 acres of waterfowl habitat if the rice fields were reflooded following the rice harvest.

7. Wildlife food and cover area established in odd areas and field corners would favorably supplement that provided by the fencerows and field boundaries. These habitats would create a network of a changed ecosystem throughout the cropland area. The aftermath and residues of the croplands would be more accessible to beneficial species of wildlife.

C. Air, Land and Water Quality

1. The visual quality of the area would be enhanced with permanent water being increased by the addition of the 10 ponds and the 115-acre multiple-purpose impoundment. Additional water areas would be supplied by the 3,000 acres of land in fish-rice rotation.

2. The water quality of the 16 ponds would be improved by fencing the livestock out of the ponds.

3. The erosion control in the uplands would improve the appearance of the landscape and the water quality in impoundments and channel system.

4. Feeding area for the southern bald eagle would be improved with the additional water areas and forested lands.

WATERSHED WORK PLAN

BOGOTA WATERSHED
Dyer and Obion Counties, Tennessee

Prepared Under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.

Prepared by: Bogota Drainage District

Dyer County Soil Conservation District

Obion County Soil Conservation District

With assistance by:

U.S. Department of Agriculture, Soil Conservation Service

U.S. Department of Agriculture, Forest Service

February 1975

WATERSHED WORK PLAN
BOGOTA WATERSHED
Dyer and Obion Counties, Tennessee

February 1975

SUMMARY OF PLAN

This is a plan for watershed protection and flood prevention in the 11,500-acre Bogota Watershed LOCATED in Dyer and Obion Counties in northwestern Tennessee. This watershed encompasses the drainage area of Daugherty Creek. The watershed project is SPONSORED by the Bogota Drainage District and the Dyer and Obion County Soil Conservation Districts. The sponsors developed this work plan with assistance from the U.S. Department of Agriculture, Soil Conservation Service, and Forest Service.

Bogota Watershed originates in southwestern Obion County, and the drainage flows southward into Dyer County through the communities of Bruce's Chapel and Miston to a confluence with the Obion River about 3 miles south of Miston. The Mississippi River is about 8 miles west and Reelfoot Lake is 10 miles north of the watershed.

The Bogota Drainage District was approved by the Dyer County Court on September 17, 1917. The district was organized under the provisions of the Tennessee Drainage District Act of 1909, as amended. The district has been combating flood and drainage problems since its organization. Since 1917, the district's program has eliminated many sloughs and undefined drainageways by the construction of strategically located new channels and ditches. The efforts of the district to provide an outlet for drainage have been very beneficial during the past 54 years, but floodwater still plagues the community.

The primary PROBLEM in Bogota Watershed is an estimated $139,745 annual flood damage caused by channel overbank flow and accumulation of surface water resulting from abnormally high precipitation.

One of the largest storms in the past 32 years occurred on May 22-23, 1957. This storm produced 5 inches of rainfall in about 12 hours and had about 4.3 inches of runoff. The runoff from this storm inundated about 10,100 acres of bottom land and was evaluated as a 20-year frequency flood. Some portions of the main bottom lands will flood following a rainfall of about 1.5 inches within a 24-hour period.

The principal OBJECTIVE of the sponsors is to improve the social and economic status within the watershed and surrounding area. The sponsors believe that project measures designed to reduce flood damages will accomplish this objective. Flood damage reductions will decrease unit production costs of farming operations and will increase yields,

net income, and standard of living with socio-economic enhancement throughout the area.

The WORKS OF IMPROVEMENT planned to give relief to the flood problem are conservation measures on 5,910 acres and about 29.2 miles of stream channel work with appurtenant measures, construction of one grade stabilization structure, and mitigating measures. The channel work will involve 27.7 miles of excavation and enlargement plus 1.5 miles of clearing and debris removal on existing channels to reduce flooding in an area that is 84 percent agricultural cropland and grassland. All of the channel work involves manmade ditches or previously modified channel with ephemeral flow only.

Voluntary application of land treatment measures and land use adjustments by the landowners cooperating with the Soil Conservation Districts will enhance benefits to be derived from structural measures. Cost-sharing assistance available under the Rural Environmental Assistance Program or other programs will be used. Technical assistance for applying and maintaining the measures will be furnished by the U.S. Forest Service, Tennessee Division of Forestry, and Soil Conservation Service.

Environmental effects of the project are:

The project measures will reduce upland erosion by about 60 percent and reduce average annual floodwater damage on 10,100 acres of flood plain land by an estimated 73 percent. About 90 percent or 126 of the 140 parcels of property in the watershed will be directly benefited.

Vegetative cover on 29.2 miles of stream channels will be disturbed or destroyed during construction and use of this area by wildlife will be temporarily interrupted. The net value of products produced on 222 acres of cropland and 10 acres of pastureland will be lost during one cropping season. Eighty-five acres of cropland will be permanently lost but will be diverted to wildlife habitat. Sixty-one acres of trees and shrubs in the present channel will be lost. The present 44 acres of spoil area will be increased to 113 acres established in wildlife food and cover-producing trees and shrubs. The 41 acres of maintenance area (berm) will be established in grass cover. A total of 121 acres of wildlife food and cover will be established to replace the 105 acres lost.

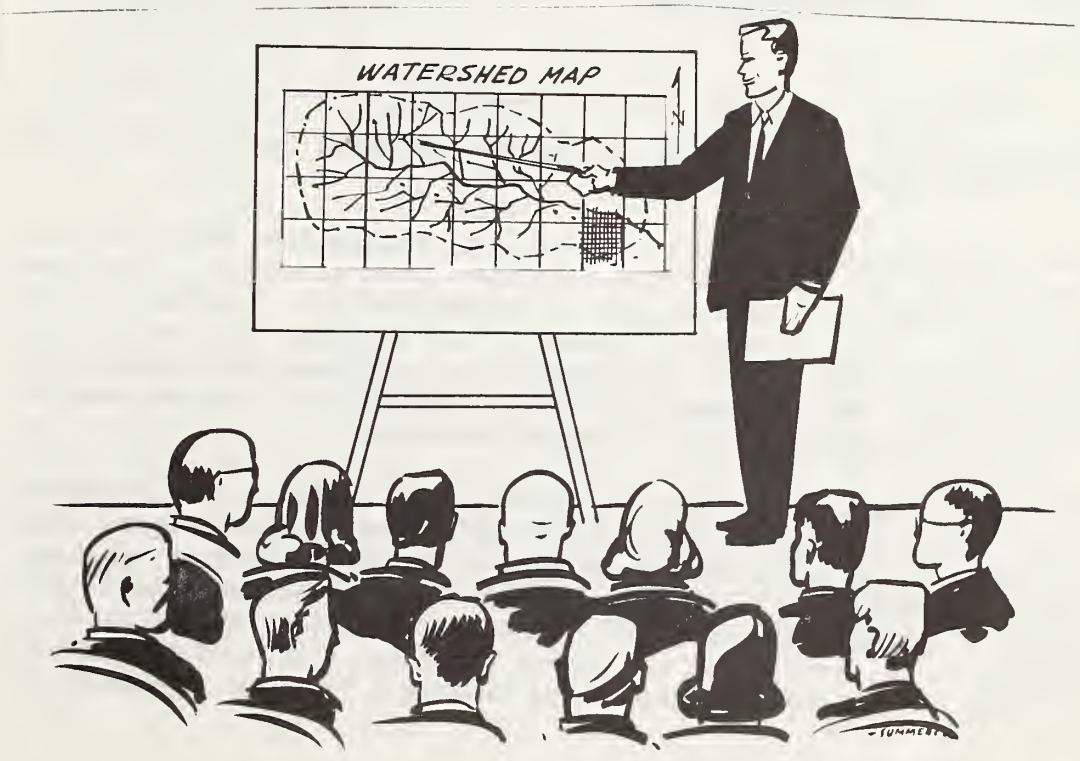
The estimated INSTALLATION COSTS of the project measures are:

Cost Items	P.L. 566 Funds	Other Funds	Total Cost
(1) Land Treatment	21,400	207,100	228,500
(2) Modification of about 29.2 miles of stream channel	296,400	82,000	378,400
(3) Project Administration	30,000	18,000	48,000
TOTAL PROJECT COST	347,800	307,100	654,900

Average annual BENEFITS to be derived from this project are $105,990 and the average annual COST of $33,844 yields a benefit-cost ratio of 3.1 to 1.0. Estimates also indicate that about 90 percent or 126 parcels of property and 1,600 people will be directly or indirectly benefited. About 10,100 acres will be directly benefited. The annual benefits foregone without a project are $72,146.

The Bogtoa Drainage District has authority to plan and install the proposed project measures and will be responsible for adequately OPERATING and MAINTAINING the structural measures at an estimated annual cost of $8,200.

FEDERAL financial and technical ASSISTANCE will be furnished by the U.S. Department of Agriculture's Soil Conservation Service and Forest Service under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended.



WATERSHED RESOURCES - ENVIRONMENTAL SETTING

Physical Resources

Bogota Watershed is located in Dyer and Obion Counties in the northwestern section of Tennessee. The watershed encompasses the drainage area of Daugherty Creek which originates in the hill section and flows southwest to a point approximately 1 mile west of Cat Corner. The creek channel flows across flat terrain from this point to the Obion River. The Bogota Drainage District which is a legal institution created in 1917 under the Tennessee Drainage Act of 1909 (1) constructed ditches from Obion River (located in the southern most part of the watershed) north to approximately the area where Daugherty Creek intersects Bruce's Chapel and Miston to its confluence with the Obion River, about 3 miles south of Miston.

The Bogota Watershed is 10 miles north of Dyersburg, the county seat of Dyer County. It is 150 miles north of Memphis, Tennessee, with Tennessee Highway 78 traversing the watershed. The population of the watershed is 1,600 or 425 families which are classified as mostly rural.

Boundaries Bogota Project					
Watershed Area		Drainage District		Flood Plain Area	
Acres	Sq. Miles	Acres	Sq. Miles	Acres	Sq. Miles
11,500	16.4	10,061	15.7	10,100	15.8

Approximately 8,765 acres of the flood plain area is within the Bogota Drainage District.

The Bogota Watershed is part of the Lower Mississippi Water Resource Region (WRR) and is located in the Obion River subregion. The watershed is less than 0.001 percent of the WRR and is 0.9 percent of the subregion. (2) It is also located in the Southern Mississippi Valley alluvium and the Southern Mississippi Valley uplands major land resource area. The watershed is typical of most flat land watersheds in these regions with hard to define waterways.

Soil and water problem areas of the Bogota Watershed are (1) 10,100 acres of flood plain of which 2,235 acres located in the lower reach is common flood plain with Obion River; (2) 1,400 acres of uplands which has some on-site erosion problems but contributes little to off-site sediment damages; (3) 35 miles of waterways with sedimentation, vegetation and debris problems; and (4) 5,000 acres of flood plain land that needs land treatment measures to maintain

and improve productivity. The flood plain is broad, low-lying, very fertile, alluvial flats influenced by the Mississippi River and comprises 88 percent of the total watershed. The flood plain is bisected by Daugherty Creek which is an ephemeral stream. The upland area of 1,400 acres is located in the northeastern section of the watershed and is characterized by deep v-shaped valleys and narrow sinuous ridges.

The soils consist of two major Associations - Alligator - Forestdale - Dundee located in the flood plain and the Memphis Association in the uplands. The flood plain soils are highly productive and are well suited to general or grain farming. These soils are part of the higher areas of the Mississippi River bottom and are formed from silt or clay that settled out of standing or slow moving waters. They are poorly drained or somewhat poorly drained and have a subsoil of gray, acid clay. The higher bottoms were formed from silt, sand and a small amount of clay and are well drained to somewhat poorly drained. They are loamy and friable to a depth of several feet.

Soils in the upland area are fertile but occur on narrow, winding, ridgetops with the long steep hillsides having slope ranges of 20 to 50 percent. The Memphis soil makes up 80 percent of the upland association and is windblown silt deposits. The hillside soils are fertile but are highly susceptible to erosion.

The land capability classification for the soils show the following groups:

Alligator-Forestdale-Dundee Association (Bottom Lands)		Memphis Association (Upland)	
Class I	839 acres	Class I	168 acres
IIw	2104 acres	IIIe	210 acres
IIIw	7038 acres	IVe	742 acres
IIIs	72 acres	VIIe	280 acres
VIIw	47 acres		
Total	10,100 acres		1,400 acres

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are defined according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to management. The capability subclass is designated by a small letter following the Roman numeral and indicates the main limitation. The letter "e" shows the risk of erosion unless close growing plant cover is maintained; "w" shows that water in or on the soil interferes with plant growth or cultivation; and "s" shows the limitation of sand or stones. (3)

Geologic formations are unconsolidated sediments of the Mississippi Embayment section of the Gulf Coastal Plain physiographic province. Three distinctly different land forms are present. They include the flood plain of the Obion River, the alluvial plain of the Mississippi River, and the dissected silty uplands, all of which are Pleistocene in age except for recent deposits of the Obion River. (4)

The shape of the watershed is somewhat elongated with the major portion consisting of flat, low-lying bottoms with a small area of steep hills with gorge-like valleys. Elevations vary in the north-eastern segment from elevation 440.0 (MSL) to elevation 254.0 (MSL) at the valley floor.

The climate is excellent all year with an average annual temperature of 60 degrees. Temperature range from a mean of 40 degrees in January to 78 degrees in July. The average growing season is about 195 days, with the first and last killing frosts occurring in the months of October and April respectively.

Dyer and Lake Counties have an average rainfall of about 48 inches, with a low of 32 inches in 1941 and a high of 77 inches in 1957. The highest total for a month was 18 inches in January 1937. Monthly rainfall is greatest in the late winter or early spring, and the driest season is mid-fall. There are about 140 days throughout the year with measurable precipitation.

The following table gives a monthly tabulation of precipitation data at Tiptonville: (5)

Month	Precipitation (1924-42) Monthly Average (Inches)
January	5.74
February	3.62
March	4.91
April	4.58
May	3.81
June	3.80
July	4.17
August	2.85
September	3.27
October	3.15
November	3.84
December	4.22

Mineral resources are few, although some open-pit mining for sand and gravel is done. This material is used locally for road surfacing.

Ample groundwater supplies are available within the watershed area. This Mississippi alluvial plain is underlain by gravel, sand, and silt of Pleistocene age. An average of 65,000 gallons per day per foot is pumped by a well in this area. Additional greater water supplies are available from the deeper Eocene sands. Water quality is generally good and is of the calcium-bicarbonate type. (6)

The following table shows the present land use in each area of the watershed.

Present Land Use	Upland		Flood Plain		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Cropland	165	12	8135	80	8300	72
Grassland	455	33	355	4	810	7
Forest Land	465	33	965	10	1430	12
Idle	275	20	195	2	470	4
Miscellaneous	40	2	450	4	490	5
	1,400	100	10,100	100	11,500	100

The flood plain is predominantly flat cropland with small areas of woodland scattered throughout. Farming operations in the flood plain occurs right up to the ditch banks and waterways where they are defined. The upland area is steep enough to inhibit the efficient use of farm machinery. There is a land use change trend occurring which includes cropland and idle land reverting to grassland or forest land.

The riparian or channel and bank area consisting of a 50-foot strip on both sides of the channel was included in the land use for the flood plain in the above table. This area consists of the following uses:

Cropland	192 acres
Pastureland	10 acres
Forest Land	23 acres
Channel	69 acres*
Spoil	44 acres**
Total	338 acres

*61 acres are trees and shrubs and 8 acres are open
**All 44 acres are in trees and shrubs

Daugherty Creek is the main stream within the watershed. Less prominent laterals are found throughout the watershed. All the streams are ephemeral in character, having flow during periods of surface run-off. Present stream classification is (M) manmade ditch or previously modified channel. The stream empties into the Obion River where channel work has been performed.

The stream is classified by the Tennessee Water Quality Control Board, Department of Public Health, for fish and acquatic life; irrigation; livestock watering; and wildlife. (7)

The channel alteration work on the Obion River provides less than a once-in-3-year level of protection for all of the common flood plain in the watershed. The constructed Obion channel has a 100-foot bottom width at elevation 238 feet (MSL). The Bogota outlet channel has a present bottom width of 18-20 feet at elevation 244 feet (MSL). (8)

There are six 1-acre or larger farm ponds in the upland sections of the watershed.

Based on the U.S. Fish and Wildlife Service classification system, (9) there are about 9,142 acres of Type I wetlands, and about 47 acres of Type 6 and 7 wetlands scattered throughout the watershed.

There are five bridges on State Highways 78 and 103, twelve bridges on improved county roads and sixteen bridges on unimproved roads.

Present and Projected Population

The present population of Bogota Watershed is estimated to be about 1,600. Projections indicate that farms will continue to increase in size and decrease in numbers. Based on landowner interviews, the population is estimated to be about 800 in the year 2020.

Economic Resources

The economy of the Bogota Watershed area is based primarily on agriculture, with the major crops being cotton, corn, and soybeans. Frequent flooding on the fertile bottom lands, restrictions on local sources of operating capital, and limited opportunities for local employment have resulted in a declining economy of this watershed as compared to similar agricultural areas in Dyer, Lake, and Obion Counties.

Cotton provides about 35 percent of the agricultural income; corn, soybeans, and small grain provide 60 percent; livestock and livestock products provide 5 percent; and forestry provide less than 1 percent. Present average yields per acre are corn, 70 bu.; cotton, 650 lbs.; soybeans, 20 bu.; and pasture, 6 AUM.

There are estimated to be about 425 families in the watershed. There are 140 parcels of privately-owned property. About 100 parcels of property are classified as general or cash grain farms. Farms are decreasing in number but increasing in size. The watershed is located within a highly mechanized farming area in Tennessee. As a result of the change to mechanization in the farming operations, a surplus of available labor has occurred. Most of the surplus labor has retired or moved to surrounding towns to seek employment. The remaining labor force is generally fully employed with seasonal underemployment when farm operations are near a standstill. The labor force is about 630 people. Estimates indicate that about 24 are unemployed and about 200 underemployed.

The average size farm is about 175 acres and varies from about 10 to 1,000 acres. About 5 percent of the 100 farms are classified as commercial and 95 percent are considered to be family farms. The current average value, including fixed improvements, of the farms in the flood plain is about $85,000 and in the uplands about $35,000.

The public property in the watershed is confined to right-of-ways for roads. Tennessee State Highway 78 and 103 with a connecting system of county roads bisect the area. The north-south route of the Illinois Central Railroad parallels the western boundary. This system of roads provides easy access to nearby towns and markets.

Dyersburg, the county seat of Dyer County, is located about 10 miles south of the Bogota Watershed. It is the largest trade center in the area. The town of Ridgely, also a major market center, is located about 6 miles to the north in Lake County.

The average market value of products sold per farm is estimated to be about $12,500, with net income of less than $4,000 per farm. Most of the retirees are receipients of social security, with an average monthly payment of about $100. (10) Per capita income for 1973 was about $2,700 as compared to the state per capita income of about $2,900 and the national per capita income of about $3,700.

Plant and Animal Resources

The predominant tree species in the upland forest land are yellow poplar, southern red oak, and white oak. The predominant tree species in the bottom lands are red oak, sweetgum, and hickory in the well-drained soils and cypress, willow, and sycamore on the poorly-drained soils. Plant communities on the cropland are cotton, corn, soybeans, and small grain with the normal invasion of johnsongrass, smartweeds, and foxtail, which is characteristic of this section of Tennessee. Grasslands are composed of both warm season (bermudagrass) and cool season (tall fescue) grasses with the normal reversion to native grasses where management is deficient.

Fence rows are almost nonexistent. Approximately 15 miles of channel are the only vegetative edges present in the bottom lands. Most of these ditches have grown up in trees (some 10 to 14 inches in diameter) and other vegetation.

Plant community changes taking place are in those areas of upland that were formerly cropped and are now idle. These specific areas are reverting to forest land and are in the stages of plant succession going from annual plants through perennial herbaceous plants and grasses to woody plants. Other land uses are not displaying any particular change in plant communities.

Wildlife resources for the entire area are considered to be low since cropland is the major land use. Small scattered woodland tracts, grown-up ditches, and a few idle areas provide the only habitat for raccoon, squirrel, and rabbit. Hunting importance for these

species would be rated as low. Quail and dove are present in a few areas but receive light hunting pressure.

Stream fishery resources are insignificant due to the stream having an ephemeral flow. Fish use of the channels would be predicated by the intensity and duration of flooding. When floodwaters recede, fish use would be curtailed. The six farm ponds in the upland portion of the watershed have been stocked with bass and bluegill.

The common flood plain of Daugherty Creek and the Obion River provides some migratory waterfowl winter habitat. When the wooded areas at the lower end are flooded, waterfowl habitat conditions would be good. A small swamp is located in the upper end of the flood plain which will have some use by waterfowl. Beavers use this area and other water areas in the forest lands.

The rare and endangered species of wildlife as identified by Bureau of Sports Fisheries and Wildlife that use this area is the Southern Bald Eagle. There is a concentration of this bird species wintering in the Reelfoot Lake area (10 miles north) and the Bogota area would be included in the feeding zone. When floodwaters recede leaving shallow potholes of water with fish, feeding areas for this bird are present as the potholes go dry. The area of swamp land (see physical resources) would also be a feeding area.

Recreation Resources

Recreational resources are practically nonexistent. The only recreation within the watershed is hunting, primarily waterfowl. The Mississippi River, 8 miles west, and Reelfoot Lake, 10 miles north, provide the waterbased recreation. Six farm ponds in the hill area provide some fishing.

Archaeological, Historical, and Unique Scenic Resources

The National Register of Historic Places does not list any site of historic interest in the watershed, and no sites are in the process of being nominated to the register. (11) According to data from the Chucalissa Indian Museum, no sites of archaeolgoical significance are present.

Soil, Water and Plant Management Status

Present trends in the watershed flood plain are a slight increase in cropland, grassland and miscellaneous areas and a decrease of about 400 acres in forest land. Additional cropland will be utilized primarily for soybeans. Forty-three percent of the hill land formerly in row crops has been retired from cultivation and planted to grass or reverted to trees. The cropland is interspersed throughout the upland area in small tracts varying in size from 5 to 20 acres. Most of these are along the small draws or flatter parts of the ridge tops.

The following table shows present and projected future land use in the watershed.

WATERSHED LAND USE

Land Use	Present		Projected Future	
	Acres	Percent	Acres	Percent
Cropland	8300	72	8890	77
Grassland	810	7	1030	9
Forest Land	1430	12	1030	9
Idle	470	4	0	0
Miscellaneous	490	5	550	5
	11,500	100	11,500	100

The watershed is serviced by the soil and water conservation districts of Dyer and Obion Counties. The districts were organized in 1940 and 1941, respectively. Soil surveys for Dyer and Obion Counties have been published by the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Tennessee Agricultural Experiment Station.

Owners of 70 farms or 70 percent of the watershed area are cooperating with the Soil Conservation Districts, and about 53 percent have active conservation plans. Fifty-five percent of the needed soil and water conservation treatment measures have been applied, and about 100 acres of critically-eroding uplands have been stabilized (see Table 1A).

Projects of Other Agencies

The Flood Control Act of 1948 authorized the Corps of Engineers, Memphis District, to make channel alterations on the Obion and Forked Deer Rivers and their principal tributaries. Construction by the Corps of Engineers has been completed on the Obion River in this area and extends upstream beyond where the Bogota project empties into the Obion River.

The U.S. Department of Agriculture has been directed to make a survey of the Obion River Basin. The survey will be made under the provisions of Section 6, Public Law 566, the Watershed Protection and Flood Prevention Act. Section 6 authorized the Secretary of Agriculture, in cooperation with other federal, state, and local agencies to make investigations and surveys of the watershed and rivers and other waterways as a basis for

the development of coordinated programs. The study will give special attention to soil, water and related development opportunities to stimulate economic growth and enhance the welfare of the people of the basin.

The major problem areas in the Bogota Watershed are floodwater damages on 10,100 acres of flood plain lands; 1,400 acres of uplands which has some on-site erosion problems but contribute little to off-site sediment damages; 35 miles of waterways with sedimentation, vegetation and debris problems; and 5,000 acres of flood plain that needs land treatment measures to maintain and improve production. Other problems related to the water management include mosquitoes and other pesky water-related insects, beavers, interruption of traffic when roads and bridges are flooded, and poor aesthetics due to excessive water. Associated resource development needs are minor with respect to recreation, distribution of income, fish and wildlife habitat, livestock and crop production, forest land management, and environmental enhancement other than water management.

Land and Water Management

Because of ownership patterns, resource-owner operator arrangements, and the necessity of large capital outlays, there is little local incentive to deal with the water management problem of flooding. As a consquence of this lack of incentive, there is not only an underutilization of hired labor but also the restriction of long-term investment to meet only the needs of land use, erosion control, and previously committed factors of production. An individual approach by resource owners is not a practical solution for solving the water management problem. There are some on-site erosion problems in the Bogota Watershed uplands that the current land and water management program of the Dyer County and Obion County Soil Conservation Districts are correcting through their present programs. Soils in this watershed do not present a fertility problem with normal application of plant nutrients and use of crop residue.

The available water capacity of the Memphis Soils located in the upland is considered adequate for growing most plants. The steep slopes of the area will affect the moisture supply due to excessive relief.

The inherent characteristics of the soils in the flood plain problem area indicate slow permeability and poor drainage. The soil-water relationship problem is due to flooding, standing water, and the sticky-clay surface layers of some soils. In the flood plain there are low areas and irregular surface relief that contribute to the problem of water management.

Land adjustments in the upland are proceeding at a satisfactory rate and are projected to continue with technical assistance from the local Soil Conservation Districts. Better management of plants will improve hydrologic conditions. Lack of vegetation management in most of the existing waterways and channels is a factor

contributing to water management problems.

Landowners are willing and able to improve the land and water conditions in the uplands. This is demonstrated by the fact that 70 percent of the farms are cooperators and 53 have an active resource conservation plan for their farm with the Dyer County and Obion County Soil Conservation Districts. It is estimated that 95 percent will be cooperators by 1975 and 75 percent will be following a resource conservation plan.

Floodwater Damage

Frequent flooding of crops, pasture and roads is the primary problem in the Bogota Watershed. Floodwater damages occur from abnormally high direct precipitation. Flooding occurs on some portions of the 10,100-acre flood plain on the average of about twice a year during the cropping season and three to four times during the entire year. Durations of the flood cause stunting and killing of crops, especially young soybeans, cotton and corn. Deterioration of crops is increased due to the duration of flooding and harvesting of crops is impaired.

Spring floods frequently delay land preparation and planting of the bottom lands. Floods that occur after normal planting time make it necessary to prepare a new seedbed before replanting. Farmers are forced to substitute a short-season variety for a full-season variety or to change crops. The results of replanting include broken or uneven stands, increased cost of production and reduced net farm income.

Floodwater depths are rather shallow and velocities are low due to the slight variations in elevations. Durations of overbank flow generally last for several days. The shallow flooding of roads and low velocities of the floodwater results in deposition of silt on the roads which become hazardous to the traveling public.

The results of the frequent flooding is an estimated $139,745 average annual damage to crops, pastures and associated indirect damage (Table 5).

Portions of the main flood plain will flood following a rainfall of about 1.5 inches within a 24-hour period. Records indicate that Dyer and Lake Counties have an average rainfall of about 48 inches with a low of 32 inches in 1941 and a high of 77 inches in 1957. The highest total for a month was 18 inches in January 1937.

The flood plains are broad, low-lying, very fertile, alluvial flats of the ancient Mississippi River. Variations in elevations are slight but some strips rise as much as 10 feet above the surrounding flats. Prior to 1917, channels within the dissected uplands were well defined but upon reaching the alluvial plain, they spread out into numerous, undefined drainageways and meandering sloughs. In 1917, the Bogota Drainage District constructed channels and ditches

to provide drainage. This improvement eliminated many of the stagnant sloughs and breeding places for mosquitoes and other disease-carrying insects.

Investigations of present average channel capacities revealed that the channels are capable of removing only 0.34 inches of runoff per day. It would take approximately 6 days to remove 2.4 inches of runoff resulting from a 3.8 inch rainfall during a 24-hour period over the watershed. The following acre-frequency relationship table illustrates the probability of a flood occurring:

Frequency	Runoff (Inches)	Acres Flooded
0.5	1.31	3,790
1	1.83	4,825
2	2.38	5,670
5	3.14	7,460
10	3.71	8,540
25	4.50	10,100
50	5.10	10,100
100	5.70	10,100

About 2,235 acres in the lower end of the watershed is common flood plain of the Obion River. This area is subject to flooding from the Obion River as well as runoff from the Bogota Watershed.

Landowners report that average yields have been depressed by flooding. The following table shows the estimated percent yield losses and land use distribution:

Land Use	Percent Distribution	Percent Yield Loss
Cotton	13	18
Corn	12	25
Soybeans	56	30
Pasture	3	30
Woods	11	-
Miscellaneous	5	-

The magnitude of the flood problem is illustrated by the following reports: A Dyersburg newspaper, "The State Gazette", gave the following accounts of a 1932 and a 1937 flood:

January 21, 1932

"Several miles of Highway 20 west of Dyersburg are reported under water. Highway 103 from Bogota to Tennemo in Dyer County is partly under water and there is some water over Highway 78 from Dyersburg to Reelfoot Lake...."

February 11, 1937

"Visit by Boat to Bogota from Miston Reveals Large Section of This Thriving Farming Community Now in Pitiful Shambles -

Floodwaters have laid untold waste over this thriving and fruitful region of Dyer County's delta...."

One of the largest storms in the past 32 years occurred on May 22-23, 1957. This storm produced 5 inches of rainfall in about 12 hours and had an estimated 4.3 inches of runoff. A Dyersburg newspaper, "The Guidepost", gave the following account of the flood:

May 23, 1957

"Heavy Damage by Winds and Rains in County. Several residents of Dyersburg and surrounding area are suffering considerable damage from the torrential rains and high winds that have been quite prevalent during the past week... The high winds and rain that created all this havoc occurred about midnight Wednesday night, and it came with such force that great numbers of the residents got out of bed and headed for storm cellars or other points of safety. After the storm subsided, another one hit about 3 o'clock Thursday morning and those who weren't aroused by the first, joined their neighbors in seeking safe shelter...."

A Jackson newspaper, "The Jackson Sun", gave an account of the May 1957 flood in Dyer and Lake Counties:

May 24, 1957

"Dyer Flood Loss at $3.5 Million; More Expected. The State Commissioner of Agriculture said today he will ask that two northwest Tennessee counties be declared disaster areas because of yesterday's flash floods.... No estimate was available of the damage in nearby Lake County but Commissioner Buford Ellington said about 75 percent of the 15,000-acre cotton crop was damaged, 50 percent of the 12,000-acre soybean crop ruined, 8,000 acres of corn lost, along with 4,200 acres of small grains, and 750 acres of truck crops...."

The Bogota Watershed project was studied in five evaluation reaches. These are:

Reach 1 - Obion River upstream to Highway 103
Reach 2 - Highway 103 upstream to Highway 78
Reach 3 - Highway 78 upstream to Tennessee Highway 8165
Reach 4 - Lateral 7 from Highway 103 to Highway 78
Reach 5 - Lateral 7 upstream from Highway 78

The primary problem in all reaches is flooding; however, most of 1, 2, and 3 flood annually and reaches 4 and 5 flood at a lesser frequency.

Looking west from Tennessee State Highway 78, H. O. Lester's farm was just one big pond on January 30, 1969. Lateral 3 is in center background.

Typical flooding on secondary gravel road.

View of Mrs. Hattie Denton's home located about 1 mile north of Bogota, January 30, 1969.

Mrs. Ruth Ladd's store located south of Calvary Church, January 30, 1969.

"Water, Water, Everywhere" after a 3.5 inch rain. A view of Ernest Rice's farm just north of Calvary Church Jan. 30, 1969.

Herman Henderson, operator of W. G. Burk's farm, viewing the January 30, 1969 flood.

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Indirect damages are associated with the direct flood damages. The losses are less obvious but are just as real and their effects are felt longer after the flood has subsided. Indirect damages that occur are disruption of employment, interruption of management, sales, etc., the disruption of traffic, mail delivery and school bus service, delay and inconvenience to the traveling public, and the interruption of the management, feeding, disease control program, and marketing of livestock and livestock products. These indirect damages amounted to $12,705 annually.

Erosion Damage

While erosion is no longer a major off-site problem on the upland problem area, some acres of sheet and rill erosion do exist. At the time of the inventory (1970-71), approximately 165 acres of cropland, 455 acres of grassland and 340 acres of forest land had excessive erosion rates. Average estimated erosion rates were: cropland, 35 T/Ac/Yr.; grassland, 8.5 T/Ac/Yr.; forest land 2.4 T/Ac/Yr. These rates are being reduced by present programs and management practices. There are no active critically eroding areas in the watershed at this time. Water velocities are low during flood stages; therefore, scour damage is not a problem.

Sediment Damage

Overbank deposition of sediment on the flood plain area has not caused a loss in the productive capacities of the soils. The soil textures are very similar, and magnitude of the deposition is generally so slight that no significant damage results. The shallow flooding of roads and low velocities of the floodwater results in sediment deposition on the roads which is hazardous to the traveling public.

In recent years the high erosion rates of the uplands has been reduced by land use changes. Prior to these changes, sediment deposition in the channels, improper maintenance from 1941 to 1948, and some indiscriminate dumping in the channels contributed to the deterioration. As a result of these problems from 1917 to 1948, the channels have lost capacity due to sediment deposition, brush and tree growth, and debris. From 1948 to the present, the channel has stabilized and reached equilibrium except for continued plant growth and debris.

Average annual suspended sediment yield of the watershed is estimated to be about 4,170 tons/year or 141 parts per million. The stream has virtually no bedload. This sediment load is rather insignificant when compared to the suspended load and bedload of the Obion River.

Drainage

No project structural measures are deemed needed to meet current drainage requirements. The main and tributary channels have adequate depth for drainage but lack capacity for floodwater. The frequency, duration, and magnitude of overbank flow have retarded the practicability of maintaining adequate on-farm drainage systems. Associated on-farm drainage as a land treatment measure is needed to assist the realization of maximum benefits from structural measures. Land smoothing, row arrangement, bedding and open field drains will meet this need.

The soils in the flood plain are classified according to limitation for crop production which is primarily an excess water problem due to frequent flooding. (3) The flood plain soils are described in the Physical Resource Section.

Irrigation Problems

Practically all of the soils in the Bogota Watershed would respond to irrigation. However, normal rainfall is usually sufficient to provide adequate moisture for good crop production.

An analysis of climatical data indicates that actual and potential evapotranspiration will occasionally exceed precipitation during the period from May through September. Supplemental water for irrigation during dry years can be secured by individual landowners with shallow wells.

Municipal and Industrial Water Problems

Reports of the Tennessee Water Resources Division and U.S. Geological Survey indicate that ample ground water supplies are available throughout this area to meet any demand. (6)

Recreation Problems

The nearest recreation area is the 10,000-acre Reelfoot Lake, located about 10 miles north of Bogota outside the watershed. This lake supplies most of the waterbased recreation needs of the people in the watershed.

Plant and Animal Problems

The trends of land use changes in the uplands (see soil, water and plant management status) will improve this area for forest game species of wildlife, but openland species will decline. The continued decrease of forest land in the bottom land will eliminate the forest game species habitat. The trend toward larger fields and use of cropland for soybean production has decreased the cover and availability of foods for rabbit and quail. Fence rows, field boundaries and ditch banks provide food and cover. More efficient tillage and use of herbicides in the cropping systems will decrease the incidence of food producers such as foxtail, et al.

Beavers have become a problem in the water management system by plugging and damming of drainageways and outlet pipes with trees and other vegetation. Levees have been weakened by their burrowing activities.

Social and Economic Problems

The demographic makeup of the social and economic conditions in this watershed differs from that of the state and nation. The U.S. and Tennessee have both experienced population increases while the watershed has consistently decreased during the past 3 decades. This declining population has been plagued with a smaller percentage of male population and a larger percentage of more dependent young and old age groups. Employment opportunities have caused outmigration of the younger labor force as they complete their secondary education. The major portion of the civilian labor force is employed in agriculture. The employment opportunities for higher skilled jobs outside agriculture indicates the economic incompetency to generate employment opportunities for semi-or-unskilled labor.

The agricultural sector, in terms of both output and per capita income per employee, is comparable to that of Dyer County and Tennessee. However, payroll per employee in agriculture is very low when compared to other industries. The watershed area is in an economically-depressed area since about three of every five families in the region have a median family income of less than $3,745, which is considered poverty level.

PROJECT FORMULATION

An application for project planning assistance was filed on or about August 17, 1962, with the State Soil Conservation Committee by the sponsoring organizations which are the Bogota Drainage District, Dyer County Soil Conservation District, and the Obion County Soil Conservation District. The State Soil Conservation Committee approved the application and submitted it on October 19, 1962, to the United States Department of Agriculture. Preliminary investigations, which consisted of data gathering, was initiated on April 1, 1969, by the Soil Conservation Service. The preliminary investigations indicated a physically and economically feasible project.

A public informational meeting was held on October 14, 1970, prior to requesting planning authorization for the watershed to present the preliminary investigation report. All interested agencies, groups and individuals were invited to attend and to comment or ask questions about the report.

After preliminary draft of the work plan had been developed and tentatively agreed upon by the sponsors, a second public meeting was held to explain the plan and solicit public reaction. This meeting was held in the watershed on October 21, 1971. All recommendations and suggestions by interested agencies and individuals were considered during work plan development.

Agencies contacted for suggestions and consultation during the planning process included the Memphis District of the Corps of Engineers, Region IV Environmental Protection Agency, U.S. Fish and Wildlife Service, Tennessee Department of Public Health, Tennessee Game and Fish Commission, Tennessee Conservation Department, and the Tennessee Historical Commission.

Several meetings were held in the watershed by the sponsors. All of these meetings were open and were designed to allow ample opportunity for the sponsors, organizations, agencies, and the general public to participate in the development of objectives, consider a wide range of alternatives, to raise issues and to provide inputs into the planning process. Minutes of these meetings are on file with the Bogota Drainage District, 113 St. John Avenue, Dyersburg, Tennessee.

Objectives

The sponsors' initial objectives were to obtain an adequate disposal system to remove surface waters from the watershed area. Additional investigations and discussions revealed that the problem was flooding from the overland flow. This was caused by channels of inadequate capacity, flat terrain, and slowly permeable soils. Most of the

channels have adequate capacity for drainage. Other problems of secondary nature were water ponding on low areas, soil movement in the uplands, and sedimentation of ditches and waterways (see Problem Section for detailed information).

Project objectives finalized by the sponsors after several months of investigations, reviews, and deliberations are:

1. Reduce floodwater damages to the extent of minimizing crop and pasture losses,
2. Reduce upland erosion to acceptable level for the soils found in this area. This range was set at 3 to 6 tons per acre for cropland, 2 to 4 tons per acre for grassland and less than 1 ton per acre for forest land,
3. Utilize each acre of soil to the extent that it will not be used beyond its capability when controls of erosion and flooding are established,
4. Remove debris, vegetation and sediment from the major waterways and ditches and arrange for maintenance for the next 50 years to insure adequate flood control,
5. Application of on-farm water management measures to the extent that project benefits will be assured,
6. Maintain wildlife habitat for small game species native to the area.

Environmental Considerations

Mosquitoes thrive in this section of Tennessee due to the prevalence of water areas frequently with emergent vegetation present. Whether this insect in this area is a vector or just a nuisance, the elimination of its breeding habitat by a water management system of channels and land smoothing was considered. This would be done in such a manner as to preclude the creation of any stream pollution problems as recommended by the Tennessee Department of Public Health. (12)

A joint study and analysis of fish and wildlife resources in the watershed was made by a work group of biologists from the U.S. Fish and Wildlife Service, Tennessee Game and Fish Commission, and U.S. Soil Conservation Service. This study was made during the preliminary investigation of the watershed. This work group suggested methods to minimize disturbance and measures to restore wildlife habitat along the sections of channels to be altered. These suggestions that were agreed to and incorporated in the work plan as construction and revegetation techniques are as follows:

1. Construct all channels from one side and stack the spoil,
2. Shape the spoil bank to 3 to 1 side slopes and a flat top. The height should not exceed 6 feet, but should be stacked as near to 6 feet as the amount of spoil will permit,
3. When clearing the opposite side, retain the mast-bearing trees. When possible, this should also be done on the spoil bank side. Biologist assistance will be used in determining the trees to be retained in the easement area.

4. The spoil bank and the berm between the bank and the channel will be established and maintained in vegetation to provide wildlife food and cover and prevent erosion.

    a. The side slopes of the spoil bank will be seeded with shrub lespedeza.
    b. The top of the spoil banks will be seeded with lovegrass at a partial rate to make clumps of grass instead of a solid cover. One row of nut or fruit-bearing tree species will be set on a 50-foot spacing. Halfway between each tree a nut or fruit-bearing shrub will be set. The tree species could be black walnut, pecan, sawtooth oak, chestnut, or mulberry. The shrub species could be hazelnut (filbert), autumn olive, or bush honeysuckle. A mixed planting of all species would be desirable; however, this will have to be determined by the availability of the planting material at the time of establishment. To control competition, trees and shrubs will be protected with a 4-foot square of black plastic mulch.
    c. The berm should be seeded to lovegrass at a partial rate to make a clumpy cover.
    d. The spoil bank and berm will be fenced from grazing when adjacent to areas that will be pastured.

5. The use of chemical herbicides to control unwanted vegetation will be confined to the channel bottom and sides. Either the berm or channel bottom can be used to provide access for ground-operated spray equipment. Herbicides used will be confined to only those that have USDA clearance for that purpose. All aerial spraying of herbicides will be prohibited.
6. The shrub lespedeza should be clipped with a rotary-type mower every third year to retard growth of invading tree species and to thicken the shrub lespedeza canopy.

A variety of measures will be used to control erosion, water, air, and noise pollution. Some practices to control erosion will be: leave native vegetation where possible (channels), temporary vegetation, orders of work, control of the location of parking areas, work areas, and access roads. Measures for air pollution control will be: watering of access roads, work areas and borrow areas to control dust; proper emission control devices on equipment; and other state, local and Service regulations. Noise pollution will be controlled by proper equipment operation and maintenance.

The proposed project will not require the displacement or relocation of any person, business, or farm operation.

Alternatives

Five major alternatives to the proposed project were considered during the planning process. They were: (1) Acceleration of Conservation Land Treatment; (2) Flood Plain Management; (3) A Floodwater Retarding Structure; (4) Channel Work; and (5) No Project.

Alternative 1 - Acceleration of Conservation Land Treatment

Acceleration of conservation land treatment was considered as the first alternative. Land treatment is needed on 8,190 acres of cropland, 860 acres of pastureland, and 830 acres of forest land. The major land treatment measures needed on upland areas are conservation cropping system, minimum tillage, and diversions on cropland; pasture and hayland renovation, management, and planting on pastureland; and forest management on forest land. Land treatment on the flood plain area would consist of land smoothing to remove irregularities on the surface of the flood plain, management of plant residues left on cultivated fields, row arrangements, (bedding), and field drainage systems. The total estimated installation costs of the needed conservation land treatment are $386,500.

Land use adjustments and better management of plants would improve hydrologic conditions. Annual flood damage reduction benefits to be derived from land treatment measures were estimated to be $7,000, a reduction of less than 4 percent. Installation of the conservation measures on the upland area would reduce average annual sediment yields from 4,424 tons to 1,788 tons.

Environmental conditions would be enhanced with the reduction of upland soil movement, improved land use, and elimination of part of the on-site water problems. Some vector and other nuisance insect control would be provided. Wildlife habitat would be improved in the upland by the land use diversity and increase of edge. Wildlife habitat of the wetland-related species would be disturbed due to land leveling and other water management practices. The total land treatment alternative would have little effect on the sedimentation, vegetation and debris problems along the 35 miles of waterways.

Alternative 2 - Flood Plain Management

Flood plain management, including accelerated land treatment, consisting of an adjustment of land use based on flooding hazards and the land capability system was considered. Areas subject to flooding once every 2 years or less frequent and that are Class I, IIw, and IIIw land were managed for cropland. Areas subject to flooding annually and that are Class I, IIw, and IIIw land were managed for grassland. Areas subject to flooding more than annually were managed for woodland. Land use changes in the flood plain would be as follows:

	Present	"With" Flood Plain Management
Cropland	8,135	4,430
Grassland	355	845
Forest Land	965	4,315
Idle	195	-
Misc.	450	510
Total	10,100	10,100

These changes in land use would decrease annual net income in the flood plain by about $157,000. Conversion costs for these land use changes was estimated to be $350,000.

Environmental conditions in the upland would be enhanced, as described in Alternative 1. Wildlife habitat (food, cover, and edge) in the flood plain would increase extensively with the 3,350 acre increase of forest land. Wildlife habitat, primarily wetland associated species, would also increase with the increase in forest land. Vectors and nuisance insects would have increased with the continued wet conditions of this area.

Alternative 3 - A Floodwater-Retarding Structure

A floodwater-retarding structure with 1,280 acres of drainage area was studied. This structure would control about 57 percent of the upland drainage area but only 11 percent of the total watershed would be behind the structure. The flood control structure would create a 35-acre sediment pool and a 110-acre flood pool. Land use changes would be (1) 10 acres of woods and 25 acres of cropland converted to water; (2) 10 acres of woods and 10 acres of grassland lost to dam, borrow and work area; and (3) 15 acres of woods, 50 acres of cropland, and 35 acres of grassland in the temporary flood pool.

This structure would reduce flood damages by about 53 percent in the area upstream from Highway 78 and have insignificant effects downstream from this highway. Annual benefits amounted to $7,356. The estimated installation cost is $416,500 and the benefit-cost ratio would be about 0.3 to 1.0.

Alternative 4 - Channel Work

The installation cost of a channel that would remove the runoff from the 1-year, 24-hour frequency storm within 24 hours was estimated to be $354,500. The modification with this channel design would reduce flood damages about 46 percent and yield a benefit-cost ratio of 1.6 to 1.0.

Environmental changes with the channel work would be initially in the riparian area described in the environmental setting section. The channel work would require clearing the trees and bushes from the existing channel and bank area. The present channel would have to

be enlarged to carry the runoff for the designed flood protection. With the channel work installed, additional environmental changes would occur, particularly in the capability Class IIIw land, such as land use conversion from forest land to cropland and animal communities changing from wooded wetland associations to those associated with open land conditions used for agricultural crop production. Vectors and nuisance insects associated with water would be sharply reduced. The effects of the two channel designs on environmental values are not significantly different due to the fact that the major clearing is in the existing channel and bank area and additional land disturbed is about the same.

Alternative 5 - No Project

The alternative of no planned project with projected future conditions was considered.

Flooding would continue to occur at the rate of three to four events per year with at least two of these floods occurring during the cropping season (April through November). The present flood damages would increase at an accelerated rate as production cost items, interest rates, value of products produced, yields, and demands increase.

Land treatment in the uplands would continue with the present conservation program of the Dyer and Obion Counties Soil Conservation District Programs. While erosion rates would decrease to more acceptable levels, there would be no noticeable effect on the rates of runoff from the hill lands. It is estimated that landowners in the flood plain would continue individual water management solutions but flooding and the "piecemeal" approach would counteract most of the benefits.

The average annual benefits foregone without a project are $72,146. If the present flood damages of $139,775 are allowed to continue for 50 years, capitalized damages would amount to about $21,900,000 at 5 5/8 percent interest.

Reasons for Alternative Selection

As a result of the planning investigations, it was found that a satisfactory amount of land use conversion and stabilization had already taken place in the uplands. It was concluded that the current conservation program of the Obion and Dyer County Soil Conservation Districts could achieve project objectives in the upland areas.

Flood plain management was not considered an acceptable alternative due to the substantial losses in net income and resulting uneconomic family farm enterprises created.

Studies of the floodwater-retarding structure showed that the structure would have little effect on reducing flooding downstream from the upland area and that it was not economically feasible. Studies were also made using lower release rates and a longer time to empty the reservoir in order to reduce the size and amount of channel improvement work. These release rates varied from about 40 to 100 cfs. The results were almost unmeasurable in affecting the required channel size and the structure was dropped.

Net average annual benefits foregone by installing the channel work alternative providing for removal of runoff from the 1-year, 24-hour frequency storm within 24 hours would be about $28,000.

To accomplish their objectives, the sponsors believe that a flood program consisting of a conservation program and a channel that would carry the runoff from the 2-year, 24-hour frequency storm would enable them to make the most profitable use of the benefited land within its capabilities.

WORKS OF IMPROVEMENT TO BE INSTALLED

The planned works of improvement to be installed are: (1) Conservation land treatment measures on 5,910 acres of land, and (2) About 29.2 miles of channel work for flood prevention. The kinds of measures, quantities, and distribution of installation costs (P.L. 566 funds and Other funds) for the project are shown on Table 1.

Land Treatment Measures

Conservation land treatment measures which consist of land use changes and conservation practices will be carried out on two problem areas in the Bogota Watershed. These two areas of treatment consist of 910 acres of upland needing treatment for improved erosion and flood prevention and 5,000 acres of flood plain lands that need land treatment to maintain and improve productivity which will assure the realization of benefits used in project justification.

Land use and treatment in the upland problem area will include converting 150 acres of cropland to grassland or grassland-cropland rotations and the use of contour farming, minimum tillage, and grassed waterways. Other treatment will consist of improving the cover conditions on 420 acres of grassland by the use of lime and fertilizer according to soil test, rotation grazing and weed control programs.

Forest land treatment measures will consist of reforestation on 120 acres of understocked stands and stand improvement measures on 220 acres to improve the hydrologic capabilities by adjusting the stand composition for optimal development and protection. Practices include but are not limited to, improvement cutting, tree release, and cull removal.

A forest management program aimed at fulfilling watershed needs and objectives will be implemented. Forest lands will be managed to fulfill wildlife, recreation, timber, and other environmental functions to the extent that such management is compatible with sound watershed management.

Land treatment on 5,000 acres in the flood plain problem area will consist of 3,500 acres of land smoothing to remove irregularities on the surface of the flood plain for improved watershed management and production. Row arrangement, bedding, tile drains, drainage ditches and management of plant residues will enhance and assure the realization of benefits used in project justification.

Acceleration of technical assistance is planned for the orderly application of the land treatment measures. The Obion and Dyer County

Soil Conservation Districts will continue to provide technical assistance with emphasis on complete resource conservation plans that emphasize the reduction of soil movement and rates of runoff. An estimated 45 conservation plans will be prepared during the 3-year installation period. These plans will represent a record of management decisions by landowners and will be the basis for timely installation of land treatment measures.

Land use planning and application of treatment practices will be in keeping with standards used in obtaining effective soil and water conservation as outlined in the Soil Conservation Service Technical Guides. (13) Technical assistance will be provided by the Tennessee Division of Forestry for an effective forestry management program.

Structural Measures

The planned structural measures consist of channel work on about 29.2 miles of previously modified or manmade channels as shown on the project map. These channels have ephemeral flow. This channel work includes about 27.7 miles of excavation and enlargement of existing channels as follows:

a. About 38,400 feet on main Daugherty Creek;
b. About 8,200 feet on Lateral 1;
c. About 8,800 feet on Lateral 3;
d. About 14,900 feet on Lateral 4;
e. About 4,600 feet on Lateral 5;
f. About 10,300 feet on Lateral 6;
g. About 24,500 feet on Lateral 7;
h. About 5,000 feet on Lateral 8;
i. About 3,300 feet on Lateral 9;
j. About 2,800 feet on Lateral 10;
k. About 5,300 feet on Lateral 11;
l. About 1,800 feet on Lateral 12;
m. About 2,400 feet on Lateral 13; and
n. About 32 improved inlets based on 500 feet of length each.

Excavation will start at about station 108+00 and end at about 492+00. A grade stabilization structure will be installed about station 108+00.

Clearing and debris removal is planned on about 7,900 feet of existing channels as follows:

a. About 1,700 feet on Daugherty Creek outlet; and
b. About 6,200 feet on Lateral 2.

Work on Lateral 2 and its outlet will consist primarily of minor clearing and the removal of drifts, brush, and trees within the wetted perimeter.

Deepening of the channel will necessitate reinforcing or underpinning the piers and abutments of four bridges located as follows:

a. Tennessee State Highway 103 and Daugherty Creek;
b. Tennessee State Highway 103 and Lateral 7;
c. Secondary gravel road crossing west of and downstream from the junction of Tennessee State Highway 78 and Lateral 7; and
d. Secondary gravel road crossing west and downstream from the junction of Tennessee State Highway 78 and Daugherty Creek.

There will be an increase in sediment load during construction. Sediment traps will be constructed in the channel to trap the major portion of the eroding materials during construction.

Improving the stream channels will require that five new wooden bridges, culverts, or fords of adequate design be constructed to replace inadequate existing structures. The locations of the five new wooden bridges or culverts are as follows:

a. Secondary gravel road crossing Daugherty Creek upstream from outlet;
b. Secondary gravel road crossing Lateral 7 immediately upstream from Tennessee State Highway 78;
c. Secondary gravel road crossing Lateral 7 immediately upstream from Lateral 9;
d. Secondary gravel road crossing Lateral 9;
e. Secondary gravel road crossing Lateral 6 north of Tennessee State Highway 103 near Miston.

The Biology Work Group recommendations listed under the environmental consideration section will be followed during construction.

The channel work is designed to remove the 2-year, 24-hour flood volume within safe duration limits of expected land use. The required discharge capacities were established to provide or reduce flood damage within safe limits for sustained agricultural production. Design data, channel capacity, and other pertinent information are shown in Table 3.

Outlet conditions of the watershed are adequate. The drainage area of the Obion River is about 2,020 square miles at its confluence with Daugherty Creek. The river was deepened about 10 or 12 feet

at this junction in the early 1960's. This deepening created a relatively steep channel gradient at the outlet of Bogota Watershed. Minor erosion has taken place but the outlet has stabilized.

A low-flow frequency analysis of the Obion River shows that water 5 feet deep or greater is maintained at least 50 percent of the time.

Daugherty Creek channel bottom will enter the river at elevation 244 feet (MSL) -- 5 feet above the bottom of the Obion River.

Stability of the channel will not be a problem because of the low velocities and the high plastic index of the soils involved. The proposed channel will be excavated in highly to moderately plastic, silty clay and clayey silt soils, according to the published Dyer County Soil Survey. The primary soils encountered are Alligator, Sharkey and Forestdale. Small areas of Dundee are interspaced between Valley Section 11, Valley Section 12, and Valley Section 13 on Lateral No. 7. Alligator and Sharkey are highly plastic, sticky clays with high shrink, swell potential. They are classed as highly plastic clays (CH) by the Unified Soil Classification System. (14) Forestdale varies from a silty loam at the surface (0-11 inches) to moderately plastic clay (11-20 inches) and highly plastic clay (20 inches) (CH-MH) subsoil. Dundee varies from a clay loam at the surface to a moderately plastic clay (CL) in the subsoil.

The plastic indicies of Sharkey and Alligator soil range from 33-35, Forestdale ranges from 17-23, and Dundee has a plastic index below 10.

As a safeguard against the degradation potential above the excavation on Daugherty Creek, a grade stabilization structure will be installed on Daugherty Creek at Station 108+00. This structure will consist of two rows of sheet piling driven to grade about 20 feet apart and at the right angles to the centerline of the channel. The open space between the two rows of pilings will be excavated to a depth of 18 to 24 inches and backfilled with large rock riprap. The rock riprap will extend across the bottom, on the side slopes and 5 to 10 feet up and downstream from the structure. Islands of compacted earth fill will be constructed on each side of the channel to divert any excess overflow around and away from the structure.

About 32 pipe drop structures will be needed for field, minor tributary, and road drains. Excavated inlets or other suitable grade control will be provided as needed. Pipe drops will be used where feasible to provide crossings for the channel maintenance road which will be constructed on one side of the channel.

The total easement area contains 453 acres. Under the present conditions, this area consists of 69 acres of existing channel, 23 acres of forest land, 307 acres of cropland, 10 acres of pastureland, and 44 acres of spoil area.

After completion of the works of improvement, the easement area will contain 41 acres of grass, 113 acres of spoil area that will be revegetated to trees and shrubs, 77 acres of channel, and 222 acres of cropland.

The entire 453 acres under easement will be available for use as a maintenance area throughout the life of the project.

If artifacts or other objects of historical or archaeological value are discovered during construction, the Tennessee Historical Commission, Tennessee Department of Conservation-Division of Archaeology, and the National Park Service will be notified.

EXPLANATION OF INSTALLATION COSTS

Land Treatment Measures

The land treatment measures have a total estimated installation cost of $228,500; $21,400 from P.L. 566 funds, and $207,100 from Other funds. These estimated installation costs include labor, materials, machinery, and all direct and indirect costs related to these measures.

The total estimated installation cost of land treatment, except forestry measures, is $220,000; $200,000 will be Other funds and $20,000 will be P.L. 566 funds for accelerated technical assistance. The funds for technical assistance will be used for the preparation and application of conservation plans.

The forest land treatment program has an estimated installation cost of $8,500. The cost of technical assistance is estimated to be $1,800, of which $1,400 will be provided under P.L. 566. The U.S. Forest Service, by and through the Tennessee Division of Forestry, will provide $360, and the going Cooperative Forest Management Program will provide services valued at $40. The landowners and operators will furnish about $6,700 for installation of the measures.

Structural Measures

The estimated installation cost of the 29.2 miles of channel work is $426,400. The cost to be borne by P.L. 566 funds for construction and engineering services is $296,400. The estimated construction cost is $247,000, which includes $22,600 for reinforcing or underpinning of the piers and abutments of the four bridges, $16,000 for 32 pipe drop structures, $7,500 for one grade control structure and $30,700 for contingencies. The estimated land rights cost to be borne by Other funds for the channel work is $82,000. Included in the land rights cost is $10,000 for the replacement of 7 bridges or culverts and the modification of about 5 farm bridges or culverts. The acquisition of land rights needed to construct the channels will not require the displacement of any person, business or farm operation as described in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970.

The total cost required for project administration is $48,000, of which $30,000 will be incurred by P.L. 566 funds and $18,000 will be Other funds. Project administration costs are those costs associated with administering the installation of structural measures. P.L. 566 funds will be used for contract administration and to provide inspection to insure that structural measures are installed in accordance with plans and specifications. Other funds will be used to provide for legal fees, land acquisitions, and other general administrative costs of the sponsoring local organization.

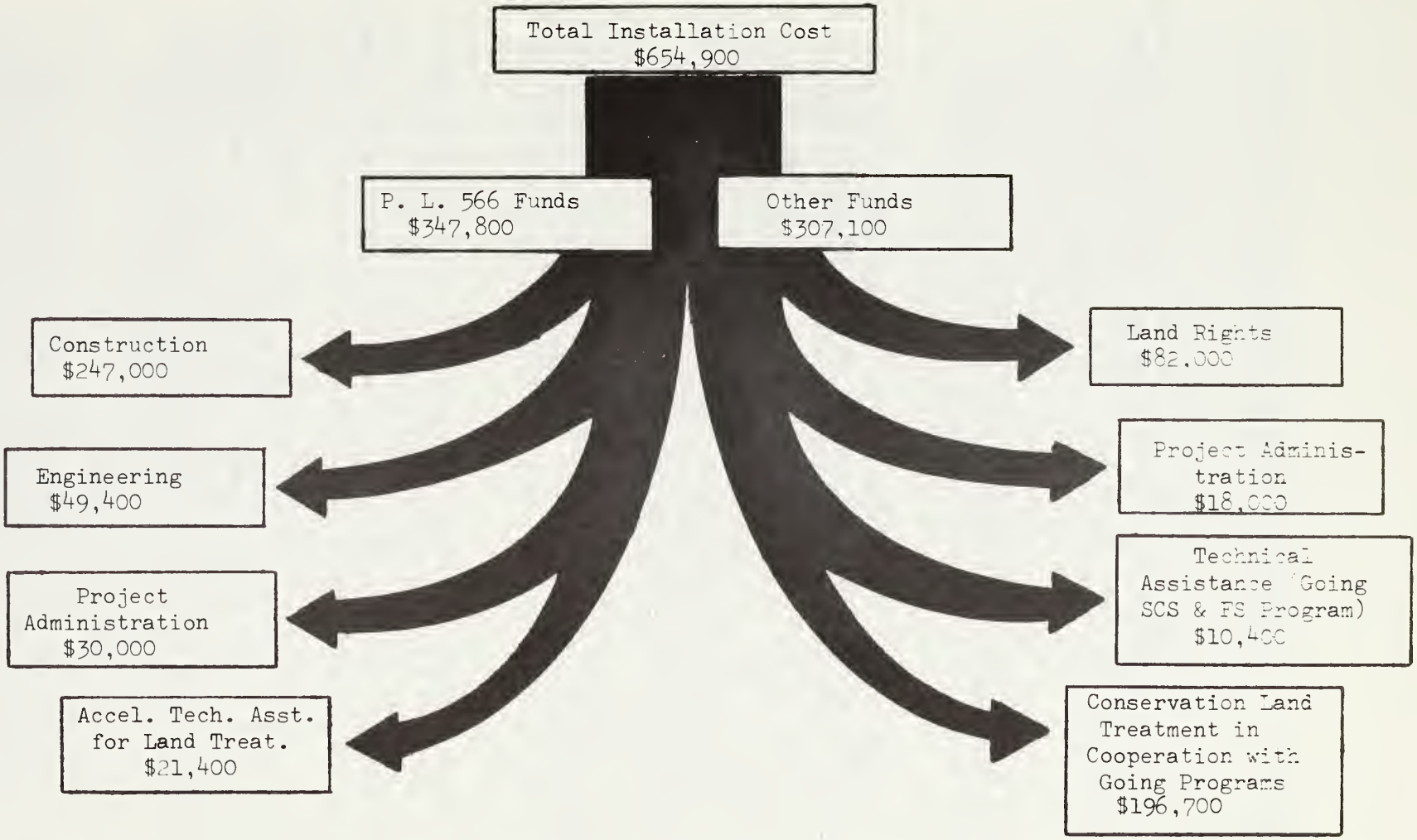
The following table is an estimated schedule of funds for the 3-year project installation period and covers land treatment and structural measures. This schedule may be adjusted from year to year on the basis of any significant change in the plan desired by the cooperating parties and in light of appropriations and accomplishments actually made.

Schedule of Estimated Installation Costs

Project Year	Estimated Cost (Dollars)				Total
	Land Treatment		Structural Measures		
	Non-Federal Land		Non-Federal Land		
	P.L.566 Funds	Other Funds	P.L.566 Funds	Other Funds	
First	6,000	40,000	46,500	96,000	188,500
Second	9,400	40,000	270,100	4,000	323,500
Third	6,000	127,100	9,800	0	142,900
TOTAL	21,400	207,100	326,400	100,000	654,900

EXPLANATION OF INSTALLATION COSTS

The total estimated installation cost of the project is $654,900, of which $347,800, or about 53 percent, will be P.L. 566 Funds, and $307,100, or about 47 percent, will be Other Funds. The following chart illustrates the distribution of cost as outlined in Table 1.



These estimates represent all of the direct and indirect cost items to install the project measure such as labor, materials, machinery, etc.

EFFECTS OF WORKS OF IMPROVEMENT

The proposed improvement in the Bogota Watershed constitutes a needed and harmonious element in the overall economic development program for Dyer, Lake and Obion Counties. Economic benefits used in project justification as well as the financial and technical assistance provided as a result of project installation will have a socio-economic impact on the community and surrounding area by improving, conserving, and utilizing the available natural and human resources. It is estimated that 90 percent or 126 parcels of property will be directly benefited and all of the 1,600 residents will be directly or indirectly benefited.

It is estimated that 10,100 acres of flood plain will be directly benefited by the 29.2 miles of channel work in Bogota Watershed. The Obion River provides less than once-in-3-year level of protection for the lower 6,000 feet of the watershed. When the Obion River floods, 2,235 acres in the lower end of Bogota Watershed will also flood and the watershed project will have little or no effect on this area. This could occur annually. When no backwater condition exists on the Obion, all of the Bogota Watershed flood plain will be benefited by the watershed project.

The Obion River is classified by the U.S. Coast Guard as a navigable stream. Current uses are limited to small boats and crafts with no record of commercial navigation. The proposed works of improvements in the Bogota Watershed will have no effect on navigation on the Obion River.

The channel work of the watershed project is designed to remove the runoff from a 3.8 inch rainfall within 24 hours (2-year, 24-hour frequency). The removal of this runoff within 24 hours will reduce direct agricultural damages by 73 percent and other indirect damages by 23 percent. Duration of flooding will be reduced about 83 percent.

Reduction in the duration of flooding will permit farmers to receive greater returns for their management and technology. The protection afforded will stimulate the farmers to increase their management inputs, such as to fertilize more efficiently, establish more effective on-farm drainage systems, and use improved varieties of seed. Farm income will be increased by about 35 percent due to decreased unit cost of production, increased mechanization and efficienty in farming operations.

The proposed project will reduce flood damages 30 percent from storms similar to the May 1957 (25-year frequency) storm which produced 4.3 inches of runoff. The voluntary application of land treatment measures and land use adjustments will assure the realization of benefits used in project justification, improve infiltration and physical condition of the soil, and aid in

maintaining the effectiveness of group facilities. All of the lands within the watershed are eligible to receive assistance from conservation programs. The installation of measures for the conservation and improvement of natural resources on at least 5,910 acres of land is in the public and private interest. Application of the planned land treatment measures will reduce runoff and upland erosion. Erosion rates will be reduced by 60 percent. The environmental influence of the forest acres will be maintained by more intensive management.

Estimates indicate there will be no increase in the total acreages of allotted crops within the watershed. Projected future land use in the flood plain with a watershed project is estimated to be:

Land Use	"Without" Project	With Project
	Acres	
Cropland	8,565	8,480
Grassland	455	455
Forest Land	565	565
Miscellaneous Use	515	600
TOTAL	10,100	10,100

The channel work on 29.2 miles of stream channels will require about 453 acres of land rights. The present and future land use and values are as follows:

Land Use	Present (acres)	Future (acres)	Present Value	Future Value
Cropland	307	222	$10,300	$ 7,500
Pastureland	10	41 1/	200	800
Forest Land	23	113	5,600	27,500
Channel	69	77	3/	3/
Spoil	44	(113)2/		
Total	453	453		

1/ Berm area will be revegetated to grass. 2/ Spoil area will be revegetated to trees and shrubs. 3/ Environmental.

The net value of products produced on 222 acres of cropland and 10 acres of pastureland in the land rights area will only be lost during one cropping season. About 85 acres of cropland will be permanently lost but will be directed to wildlife habitat. The loss to timber production on 23 acres will be deferred income which will accrue within a period of about 30 years.

The changed land use and reduction of upland erosion rates will reduce gross erosion from 12,636 tons/year to 5,110 tons/year.

Average annual suspended sediment concentrations will be reduced from 143 mg/l to 58 mg/l. The total sediment yield from the watershed will be reduced from 4,424 tons/year to 1,788 tons/year.

Conservation land treatment in the upland area will reduce erosion rates on various land uses as follows: cropland from 35 T/Ac/Yr to 10 T/Ac/Yr; grassland from 8.5 T/Ac/Yr to 3.0 T/Ac/Yr; forest land from 2.5 T/Ac/Yr to 1.0 T/Ac/Yr; and idle land from 6.0 T/Ac/Yr to 4.0 T/Ac/Yr.

These streams have only ephemeral flow, therefore, no change is expected on the quality or quantity of stream flow, water temperatures, coliform counts or agri-nutrients. There will be an increase in sediment load during construction. Sediment traps built in the channel will trap the major portion of the eroding material caused by construction. Gross erosion will depend primarily on amount and intensity of rainfall during construction. Channel erosion is not expected to be a problem during construction because of the highly plastic nature of the soils to be excavated and the low design velocities.

Flood damage reductions provided by the project will allow the orderly growth and continued development of this rural agricultural community. The health and welfare of the citizens will be greatly enhanced. Private expenditures for replacement of the flood losses can be used to increase standards of living. The project measures will help sustain present employment and create 6 new jobs and provide 60 man-years of semi-skilled employment during the installation period (3 years). Employment for the workforce now migrating to other sections of the country will be available within the community. Estimates indicate that gross farm income will be increased about $3,000.

Local secondary benefits will accrue in the watershed and surrounding area due to the installation of project measures. Goods and services produced as a result of the project will tend to stimulate local activity on a permanent basis. Products produced will require additional services from within the area.

Benefits will accrue due to the financial and technical assistance made available by the installation of the watershed project. The project will bring outside resources into the community and will provide an opportunity to use goods, services, and labor available in the local area.

The riparian or channel and bank area as shown in the environmental setting is included in the 453 acres of total easement area. The 61 acres of trees and shrubs in the present channel will be cleared for the installation of the 77 acres of channel. The present 44 acres of spoil area will be increased to 113 acres and will be re-established in wildlife food and cover-producing trees and shrubs. The 41 acres of maintenance area (berm) located between the spoil and the channel will be established in a grass cover. The loss

of the 61 acres of trees and shrubs in the present channel will be replaced by the 154 acres of wildlife food and cover on the spoil and maintenance area.

The vegetative measures, when installed and fully established, will not only replace any low value habitat presently available along the excavated side of the channels but will provide a greater area of high quality small game habitat and control erosion on the channel bank, berm and spoil area.

Studies indicate that habitat will be significantly improved by the variety of plants and shrubs recommended. The project area will be capable of supporting a greater number of birds and small game and should attract a greater variety of wildlife species to the area. Improvement in the wildlife habitat will provide increased opportunities for upland game hunting along the channels and also allow better access to the area from improved road crossings.

"No hunger-no fear!"

The small area of wetland type 6 and 7 will not be affected by the project because the channel work terminates downstream from the area. Flooding will still occur on the type 1 wetland and the conditions for waterfowl use will be unchanged.

The conversions of 150 acres of cropland to grassland or cropland-grassland rotation is the only land use change in the uplands. Cropland will decrease by 85 acres in the flood plain. These changes will cause a minor change in the plant communities. The reforestation of 120 acres of understocked stand will add a conifer to these acres of deciduous trees. The effect on the habitat will be minor. The forest management program will improve the quality of the forest habitat.

The land smoothing to remove the irregularities to avoid having the small water areas scattered over the flood plain when floodwater recedes will eliminate the incidental feeding areas for the southern bald eagle. The swamp area which is a more significant feeding area will not be affected by the channel work.

PROJECT BENEFITS

Evaluated benefits are estimated to be $105,990, Table 6. The average annual flood damage without the project is estimated to be $139,745 and the estimated benefits from flood damage reduction are $102,015, including $5,300 derived from land treatment measures, Table 5. These benefits consist of crop and pasture $92,740 and indirect $9,275. Local secondary benefits of $9,275 will accrue in the watershed and surrounding area due to project installation. Secondary benefits from a national viewpoint were not evaluated.

COMPARISON OF BENEFITS AND COSTS

The proposed 29.2 miles of stream channel work will be installed, operated, and maintained at a total average annual estimated cost of $33,844. The average annual benefits used in project justification are estimated to be $105,990, which include local secondary benefits of $9,275 accruing within the zone of influence of the project. The benefit-cost ratio accruing as a result of total project benefits is 3.1 to 1.0, and the benefit-cost ratio without secondary benefits is 2.9 to 1.0, Table 6.

PROJECT INSTALLATION

The sponsors of the Bogota Watershed project plan to install the land treatment and structural measures during a 3-year period. Land treatment measures will be voluntarily planned and applied by the landowners in cooperation with the programs of the Dyer and Obion Counties Soil Conservation Districts. The Soil Conservation Service will provide technical assistance for the preparation and application of conservation plans and will accelerate the technical assistance to the district programs from P.L. 566 funds.

The U.S. Forest Service, by and through the Tennessee Division of Forestry, will provide technical assistance necessary to install forest land treatment measures and will accelerate the technical assistance to the going programs from the P.L. 566 funds.

All structural measures will be installed within the boundary of the Bogota Drainage District. The Bogota Drainage District has legal authority to raise funds through assessments levied by the County Court and the power of eminent domain to acquire all land rights needed for the project measures for flood prevention. This authority will be used as needed for the orderly progress in installing the planned works of improvement. The Bogota Drainage District will obtain all land rights, be responsible for all costs in acquiring the needed land rights, and local project administration costs. Bridges or culverts of adequate design will be replaced as agreed upon by the sponsoring local organization, the local branch of government responsible for the roads, and the Soil Conservation Service. The sponsoring local organization will be responsible for the construction of these bridges. Each crossing will be replaced as that segment of channel excavation is completed.

After the detailed surveys and designs have been completed and prior to the signing of the project agreement, the Service and a representative of the sponsoring local organization will make an on-the-ground check to determine the adequacy of the acquired land rights, the arrangements for removal, relocation, or salvaging of buildings, roads, utilities, bridges, culverts, pipelines, and other improvements, and the relocation or reconstruction of fences. The sponsoring local organization must certify to the Soil Conservation Service that all necessary land rights have been acquired. A copy of each land rights instrument covered by the certification will be furnished the Service.

The Soil Conservation Service will provide technical assistance for design, preparation of specifications, construction inspection, final inspection, execution of certificates of completion, and related tasks for the establishment of all planned works of improvement. The Bogota Drainage District will do the contracting and will be the sponsor dealing directly with the Service.

FINANCING PROJECT INSTALLATION

Federal assistance for carrying out the works of improvement or nonfederal land, as described in this work plan, will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended. This assistance is contingent on the appropriation of funds for this purpose and the sponsoring local organizations meeting their necessary prior obligations.

Local financial responsibility will be assumed by the Bogota Drainage District. The district has sufficient legal authority through the County Court--including raising of funds through taxation or assessment and power of eminent domain--to install, operate, and maintain structural measures for flood prevention.

There are no relocation payments required of the district by the proposed P.L. 566 project.

The land treatment measures will be voluntarily installed by the landowners and operators at their own expense. Cost-sharing assistance, if available under the Rural Environmental Assistance Program or other programs, may be used in applying these measures.

The Bogota Drainage District has initiated negotiations with the Farmers Home Administration by filing a letter of intent to finance their share of the project installation costs by utilizing the loan provision of Section 8, P.L. 566, as amended. It is estimated that a $100,000 loan will be needed. The district will repay their loan through an annual assessment. The assessment will be determined so as to meet the loan repayment needs and the annual operating expense of the district. In addition, a maintenance assessment will provide the funds needed to adequately maintain the works of improvement. The annual assessment for project installation on 8,460 acres is estimated to be $0.87 per acre per year for 20 years. The exact assessment as set by the court may vary from this amount. The district expects that most of the land rights will be donated and the district will receive credit in lieu of cash for part of their share of the project costs.

PROVISIONS FOR OPERATION AND MAINTENANCE

Landowners will be responsible for the maintenance of land treatment measures installed on their farms under agreement with either the Dyer County Soil Conservation District or the Obion County Soil Conservation District. The Tennessee Division of Forestry, in cooperation with the U.S. Forest Service will furnish the technical assistance necessary to operate and maintain the forestry measures under the going Cooperative Forest Management Program. Fire protection will be continued by the Cooperative Forest Fire Control Program.

The drainage district will be responsible for adequately operating and maintaining the stream channel vegetation and associated works at a total estimated cost of $8,200 annually. The district will arrange with the landowners and operators for minor maintenance jobs to be done as a part of their regular farm operations, estimated to be $3,200 annually. The major maintenance jobs, estimated to cost $5,000 annually, will be accomplished by the district. The sponsors will provide, by annual assessment under the authority of the Tennessee Drainage District Act of 1909, as amended, and by obtaining additional authorities as needed, whatever amount is needed for adequate maintenance.

The annual assessment needed for major maintenance jobs is estimated to be $0.69 per acre per year.

The operation and maintenance of the improved stream channel will include, but may not necessarily be limited to, the removal of drifts and sediment bars from the channel and bridge openings and the control of obnoxious vegetative growth. Maintenance of improved channels is extremely important from the time of construction until adequate vegetation has been established. As the excavation will be done from one side only, the maintenance road will be on the channel berm of the excavated side.

A plan of operation and maintenance for the channel will be prepared and made a part of the basic operation and maintenance agreement as soon as detailed needs can be determined from the design. This plan will include regular inspections, reseeding significant areas where vegetation has been destroyed by erosion, cutting or spraying undesirable trees and shrubs within the channel perimeter, removing and disposing of silt bars, removing and disposing of debris, adding riprap, if needed, keeping access roads for maintenance in good condition, rehabilitating damaged pipe inlets from fields or side channels, and other items as needed to insure a stable channel that will function successfully. The plantings for wildlife food and cover will be maintained.

The Service and the sponsors will make a joint inspection annually, or after unusually severe floods, for 3 years following installation

of each structural measure. Inspection after the third year will be made annually and after severe storms by the sponsors and a report prepared by them with a copy to the Service representative.

The Bogota Drainage District and the Service will execute specific operation and maintenance agreements prior to the issuance of invitations to bid on construction of any structural measure for flood prevention.

TABLE 1 - ESTIMATED PROJECT INSTALLATION COST
Bogota Watershed, Tennessee

Installation Cost Item	Unit	Number	Estimated Cost (Dollars) 1/						
			P.L. 566 Funds			Other			TOTAL
		Non-Fed.Land	Non-Fed.Land		Total	Non-Fed.Land		Total	
			SCS 3/	FS 3/		SCS 3/	FS 3/		
LAND TREATMENT									
Land Areas 2/									
Cropland	Acre	5,150	0	0	0	164,800	0	164,800	164,800
Pastureland	Acre	420	0	0	0	25,200	0	25,200	25,200
Forest Land	Acre	340	0	0	0	0	6,700	6,700	6,700
Technical Assistance			20,000	1,400	21,400	10,000	400	10,400	31,800
TOTAL LAND TREATMENT	Acre	5,910	20,000	1,400	21,400	200,000	7,100	207,100	228,500
STRUCTURAL MEASURES									
Construction									
Channel Work 4/ (M)	Miles	29.2	247,000	0	247,000	0	0	0	247,000
Subtotal-Construction			247,000	0	247,000	0	0	0	247,000
Engineering Services			49,400	0	49,400	0	0	0	49,400
Project Administration									
Construction Inspection			10,200	0	10,200	0	0	0	10,200
Other			19,800	0	19,800	18,000	0	18,000	37,800
Subtotal - Administration			30,000	0	30,000	18,000	0	18,000	48,000
Other Costs									
Land Rights			0	0	0	82,000	0	82,000	82,000
Subtotal - Other			0	0	0	82,000	0	82,000	82,000
TOTAL STRUCTURAL MEASURES			326,400	0	326,400	100,000	0	100,000	426,400
TOTAL PROJECT			346,400	1,400	347,800	300,000	7,100	307,100	654,900

1/ Price base 1974.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed, and dollar amounts apply to total land areas, not just to adequately treated areas.
3/ Federal agency responsible for assisting in installation of works of improvement.
4/ Type of channel before project: (M) - manmade ditch or previously modified channel.

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TABLE 1A - STATUS OF WATERSHED WORKS OF IMPROVEMENT

Bogota Watershed, Tennessee

Measures		Applied To Date	Total Cost Dollars 1/
LAND TREATMENT			
Conservation Cropping Systems	Acre	2,430	29,200
Crop Residue Use	Acre	2,430	9,700
Pasture & Hayland Planting	Acre	100	6,000
Critical Area Plantings	Acre	100	10,000
TOTAL	.....	.....	54,900

1/ Price base - 1974

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TABLE 2 - ESTIMATED STRUCTURAL COST DISTRIBUTION

Bogota Watershed, Tennessee

(Dollars) 1/

Item	INSTALLATION COST - P.L. 566 FUNDS					INSTALLATION COST - OTHER FUNDS					Total Installation Cost
	Construction	Engineering	Land Rights	Relocation Payments	Total P.L.566	Construction	Engineering	Land Rights	Relocation Payments	Total Other	
Channel Work 4/ (M)	247,000 2/	49,400			296,400			82,000 3/		82,000	378,400
Subtotal	247,000	49,400			296,400			82,000		82,000	378,400
Project Administration	xxxx	xxxx	xxxx	xxxx	30,000	xxxx	xxxx	xxxx	xxxx	18,000	48,000
GRAND TOTAL	247,000	49,400			326,400			82,000		100,000	426,400

1/ Price base 1974.
2/ Includes $22,600 for underpinning four bridges, $7,500 for grade control structure and $16,000 for 32 pipe drop structures.
3/ Includes $10,000 for modification or replacement of six bridges or culverts and five farm bridges or culverts.
4/ Type of channel before project (M) - manmade ditch or previously modified channel.

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TABLE 3 - STRUCTURE DATA
CHANNELS
Bogota Watershed, Tennessee

Channel (No. or Name)	Station	Drainage Area Sq.Mi.	Capacity cfs		Hydraulic Gradient (ft/ft)	Channel Dimensions 1/			"n" Value		Velocities ft./sec.		Excavation Cu.Yds.	Type 2/ of Work	Before Project	
			Req'd	Design		Bottom Width (ft)	Depth of Flow (ft)	Side Slopes	Aged	As Built	Aged	As Built			Type of Channel 3/	Flow Condition 4/
Main Stream																
CS-6	200+00	5.75	274	316	0.00030	10	7.0	2:1	0.035	0.025	1.88	3.00		III	M	E
CS-5	284+00	6.96	324	364	0.00030	10	7.5	2:1	0.035	0.025	1.94	3.10		III	M	E
CS-4	339+00	9.33	415	419	0.00030	10	8.0	2:1	0.035	0.025	2.02	3.23		III	M	E
CS-3	404+00	9.97	440	478	0.00030	10	8.5	2:1	0.035	0.025	2.08	3.33		III	M	E
CS-2	408+00	16.54	666	670	0.00030	15	9.0	2:1	0.035	0.025	2.26	3.62		III	M	E
CS-1	451+00	17.58	700	695	0.00030	16	9.0	2:1	0.035	0.025	2.24	3.58		III	M	E
Outlet	509+00	17.92	700	1072	0.00030	470	70.0 1/		0.040	0.040	2.28	2.28	206,200	II	M	E
Lateral #1	193+00	1.10	69	86	0.00030	4	5.0	2:1	0.035	0.025	1.23	1.97	17,325	II	M	E
Lateral #2																
CS-7	156+00	0.67	46	126	0.00030	89	27.0 1/		0.040	0.040	1.42	1.42		IV	M	E
Lateral #3	285+00	0.50	36	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	13,755	II	M	E
Lateral #4	296+00	1.00	64	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	22,680	II	M	E
Lateral #5	302+00	0.19	16	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	7,245	II	M	E
Lateral #6	405+00	0.80	53	99	0.00040	4	5.0	2:1	0.040	0.025	1.42	2.27	15,645	II	M	E
Lateral #7																
CS-11	181+00	1.73	97	102	0.00030	6	5.0	2:1	0.040	0.025	1.28	2.05		II	M	E
CS-12	235+00	2.69	148	137	0.00030	6	5.7	2:1	0.040	0.025	1.38	2.21		II	M	E
CS-13	290+00	3.85	196	195	0.00030	8	6.3	2:1	0.040	0.025	1.51	2.42		II	M	E
CS-14	351+00	4.97	246	246	0.00030	8	7.0	2:1	0.040	0.025	1.60	2.56		II	M	E
Outlet	407+00	5.72	274	312	0.00030	8	7.8	2:1	0.040	0.025	1.70	2.72	53,760	II	M	E
Lateral #8	259+00	0.30	23	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	7,770	II	M	E
Lateral #9	191+00	0.20	17	50	0.00010	4	5.0	2:1	0.040	0.025	0.71	1.14	5,145	II	M	E
Lateral #10	255+00	0.15	13	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	4,725	II	M	E
Lateral #11	451+00	0.10	10	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	8,295	II	M	E
Lateral #12	215+00	0.15	13	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	3,465	III	M	E
Lateral #13	220+00	0.10	10	86	0.00030	4	5.0	2:1	0.040	0.025	1.23	1.97	4,620	III	M	E
Improved Inlets													34,230	II	M	E

1/ Side slopes on all excavated channels are 2:1. For channels requiring clearing and debris removal, the cross-sectional area and wetted perimeter are shown in the "Bottom" and "Depth" columns.
2/ II-Enlargement or realignment of existing channel or stream. III-Cleaning out of natural or manmade channel. Includes bar removal and major clearing. IV-Clearing and removal of loose debris in channel section.
3/ (M) - Manmade ditch or previously modified channel (1918).
4/ Ephemeral.

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TABLE 3A - STRUCTURE DATA

GRADE STABILIZATION STRUCTURES

Bogota Watershed, Tennessee

Site No. or Name	Drainage Area	Design Capacity Principal Spillway	Width	Drop	Type of Structure
	(Sq. Mi.)	(cfs)	(Ft.)	(Ft.)	
108+00	4.75	227	8.0	2.5	Steel

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TABLE 4 - ANNUAL COST

Bogota Watershed, Tennessee

(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost 2/	Operation and Maintenance Cost	Total
Channel Work	22,757	8,200	30,957
Project Administration	2,887	:::::	2,887
GRAND TOTAL	25,644	8,200	33,844

1/ Price base: Installation 1974, O&M Current Normalized.

2/ 50 Years @ 5 5/8 Percent Interest.

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TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

Bogota Watershed, Tennessee

(Dollars) 1/

Item	Estimated Average Annual Damage		Damage Reduction Benefit
	Without Project	With Project	
Floodwater Crop and Pasture	127,040	34,300	92,740
Subtotal	127,040	34,300	92,740
Indirect	12,705	3,430	9,275
Total	139,745	37,730	102,015

1/ Price base - Current Normalized.

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TABLE 6 - COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Bogota Watershed, Tennessee
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/			Average Annual Cost 3/	Benefit Cost Ratio
	Damage Reduction 2/	Secondary	Total		
Channel Work	96,715	9,275	105,990	30,957	3.4:1.0
Project Administration	:::::::	::::::	::::::	2,887	::::::
GRAND TOTAL	96,715	9,275	105,990	33,844	3.1:1.0

1/ Price base - Current Normalized.

2/ Flood damage reduction benefits to be derived from land treatment measures are estimated at $5,300 annually.

3/ From Table 4.

February 1975

INVESTIGATION AND ANALYSES

Engineering Surveys

Engineering field surveys on the Bogota Watershed consisted of establishing 16 miles of vertical control and 20 channel cross sections. All vertical control was established in feet with an elevation tolerance of 0.10 times the square root of the distance (m) in miles. Mean sea level was used as the control datum. Elevations of road sections, bridges, culverts, and other control points were established.

Channel cross sections were surveyed at selected locations to determine shape, width, and other hydraulic characteristics and to give an adequate picture of the present channel.

Hydrologic

Hydrologic boundaries were delineated using aerial photographs, topographic maps and field inspections of existing natural drainageways. These drainage area boundaries were used to determine flood volumes, acres flooded, and channel design.

A flood volume-frequency series was developed and used as a basis for determining present flood damage. This series established the relationship between flood volume--acres flooded and flood damage as used in overland flow and flatland watersheds. Proportional runoff volumes were developed for the 50-,25-,10-,5-,2-,1-, and 0.5-year flood events using the 50-year volume as 1.0. Runoff volumes were calculated using U.S. Weather Service TP-40, 24-hour rainfall amounts with average antecedent moisture conditions and a weighted curve number of 86.

The relationship between ratios of runoff volumes to percent chance of occurrence was plotted to determine proposed channel capacities for the 1-year and 2-year level of protection. Proposed channel capacities for removal of the 1-year event within 24 hours reduced flood damage 46 percent and 2-year event, 73 percent.

Design

Channel capacities were based on removing flood volume within safe duration limits of anticipated land use. The required discharge capacities were computed by using the relationship $Q = 64M^{5/6}$, where M is drainage area in square miles.

The channel will be excavated in highly to moderately plastic silty clay and clayey silt materials. The design velocities of 2.05 to 2.42 feet per second at Valley Sections 11, 12, and 13 are within the allowable velocities of 2.64 to 2.80 feet per second as computed by methods used in Technical Release No. 25 using "as built" conditions

and vegetating the channel during construction. The design velocities of 1.97 to 3.62 feet per second for the remaining channels are within the allowable velocities of 4.40 to 7.38 feet per second as computed by Technical Release No. 25 using "as built" conditions.

The "N" values used for "aged" and "as built" conditions in Manning's Formula were determined using Supplement "B" of Section 5 and Chapter 5, Section 16, National Engineering Handbook, as guides.

Land Treatment

An intensive investigation was made by the economist, district conservationist, agronomist, and geologist to determine the land use and conservation treatment needs. The soil survey reports for Dyer and Obion Counties were used to obtain soil profile descriptions and capabilities. Present land use was mapped on aerial photographs and served as a guide in determining future land use and cropping patterns. Conservation measures to be applied during the installation period were determined after considering: (1) future land use, (2) soil descriptions, (3) soil capabilities, (4) needs, (5) funds available from Rural Environmental Assistance Program for possible cost-sharing, (6) local resources available for installing needed measures, and (7) benefits to be derived.

Fish and Wildlife

Studies were made by biologists of the Tennessee Game and Fish Commission, U.S. Fish and Wildlife Service, and Soil Conservation Service to determine:

(1) Extent of fish and wildlife species,
(2) Importance and use,
(3) Relative value compared with other Tennessee watersheds,
(4) Effect of proposed watershed protection and flood prevention program on present fish and wildlife resources,
(5) Measures for enhancement of present fish and wildlife resources, and
(6) Mitigating measures, if needed, to temper or reduce damage resulting from installation of structural measures for flood prevention.

These determinations were made by interviews with local inhabitants, observations and comparisons with similar watersheds where intensive studies have been conducted.

Forestry

A systematic field survey showed ground cover, forest, and hydrologic conditions, and indicated treatment needs. This survey, supporting data, and information from other agencies and forestry officials served as a basis for the proposed remedial measures. The recommended measures will contribute to flood reduction and soil stabilization.

The forest land treatment measures planned on private land are limited by the expected participation and the length of the installation period.

Economics

The methods used in making economic investigations and analyses followed those approved by the Soil Conservation Service in benefit-cost evaluations on land and water resource projects. The methods followed are in accordance with instructions in the National Economic Guide. Basic data were obtained from local farmers, agricultural workers, state and county highway officials, experiment stations, and agricultural publications. Basic information was obtained by interview with landowners and operators having flood plain land and consisted of the following: Present land use and yields, normal flood-free land use and yields, anticipated land use and yields with various degrees of flood protection, information concerning the normal sequence of the various farming operations, and estimates of the percent damage to the various crops and pasture by depths of inundation or by specific storm events.

Current normalized prices were used as a basis for benefit computations, cost of production and cost of operation and maintenance. These current normalized prices were developed from standards and criteria developed by the Council of Representatives, Water Resources Council, on October 9, 1973.

A large area of cropland in this watershed lies in the flood plain. The area flooded appears to be directly related to the flood volume. The greater the flood volume, the greater is the area flooded. Flood damage is proportionate to the acreage flooded. A flood volume frequency series provided the basis for determing average annual flood damages with and without project improvements.

Local secondary benefits were evaluated and used in project justification. Secondary benefits from a national viewpoint were not used in the evaluation or justification of this proposed work plan.

Geology and Sedimentation

All available geologic maps and reports were reviewed for the purpose of noting geologic relationships. The composition of sedimentary layers, their lateral variations, and any other geologic conditions which may affect the structural works were considered.

Estimates of sheet erosion were made through the use of Musgrave soil loss predicting equation. Factors considered in this equation are land use and cover condition, percent and length of slopes, maximum 2-year, 30-minute frequency rainfall, and the basic erosion rate of the soils involved. Consideration was also given to changes anticipated in future land use and treatment.

Estimates in sediment suspended load, bed load and concentration were made using present and future erosion rates and standard Service procedures. (Technical Guide 12, South Regional Technical Service Center, Fort Worth, Texas).

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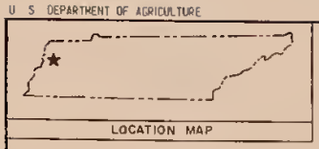
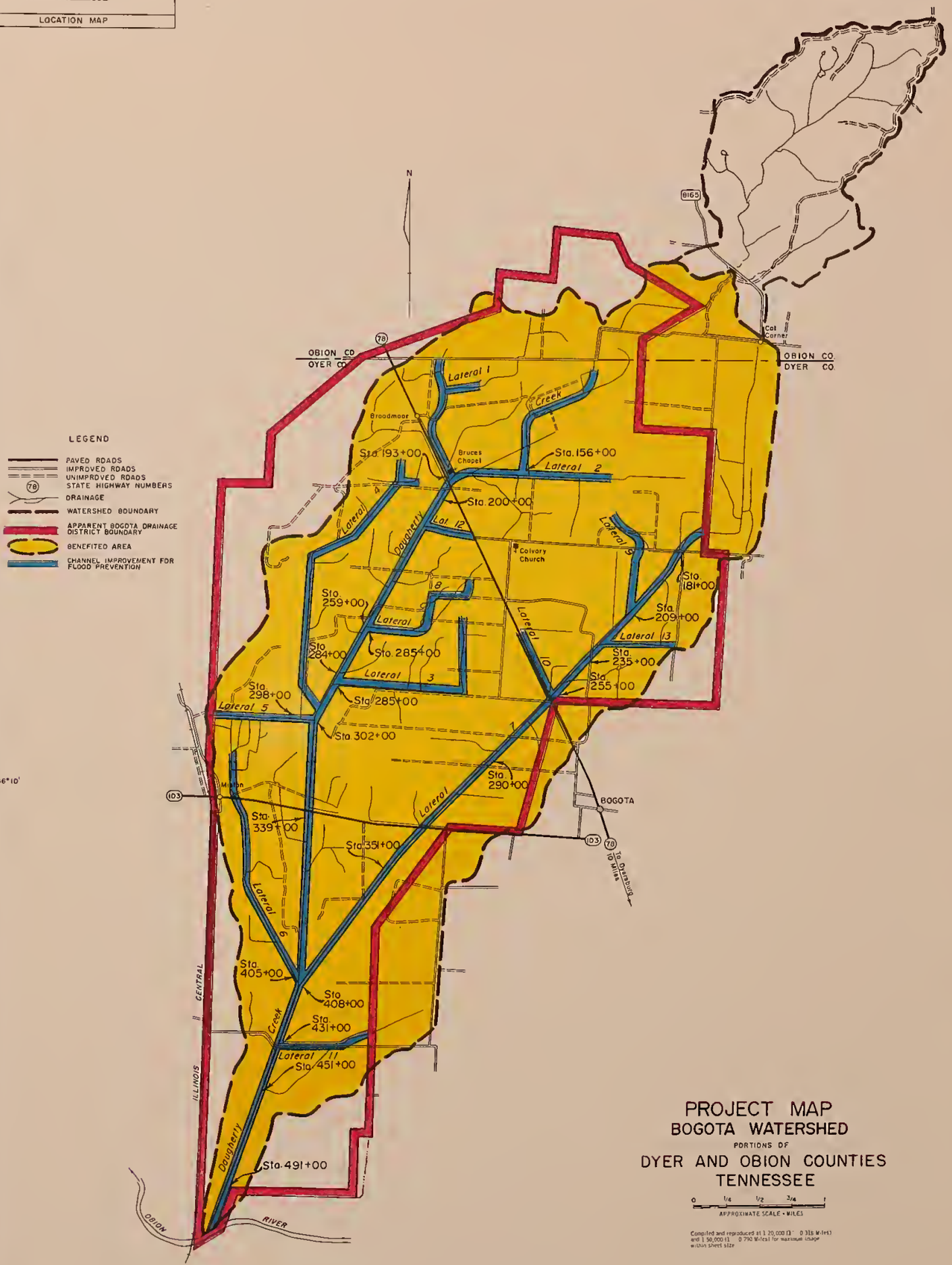
U S DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE, NASHVILLE, TENNESSEE



LOCATION MAP



PROJECT MAP
BOGOTA WATERSHED
PORTIONS OF
DYER AND OBION COUNTIES
TENNESSEE

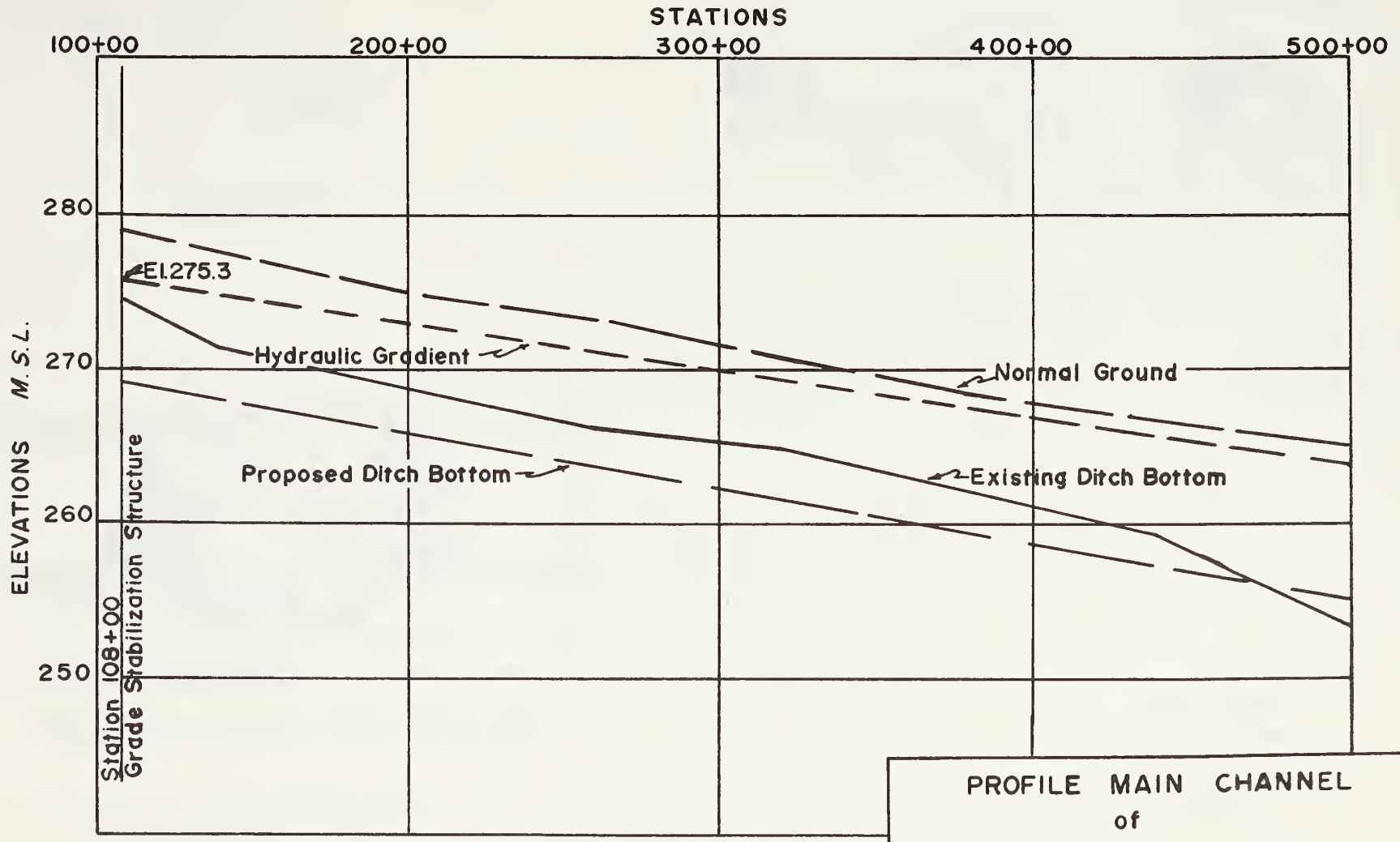
0 1/4 1/2 3/4 1
APPROXIMATE SCALE - MILES

Compiled and reproduced at 1:20,000 (1" = 0.315 Miles) and 1:50,000 (1" = 0.790 Miles) for maximum image within sheet size

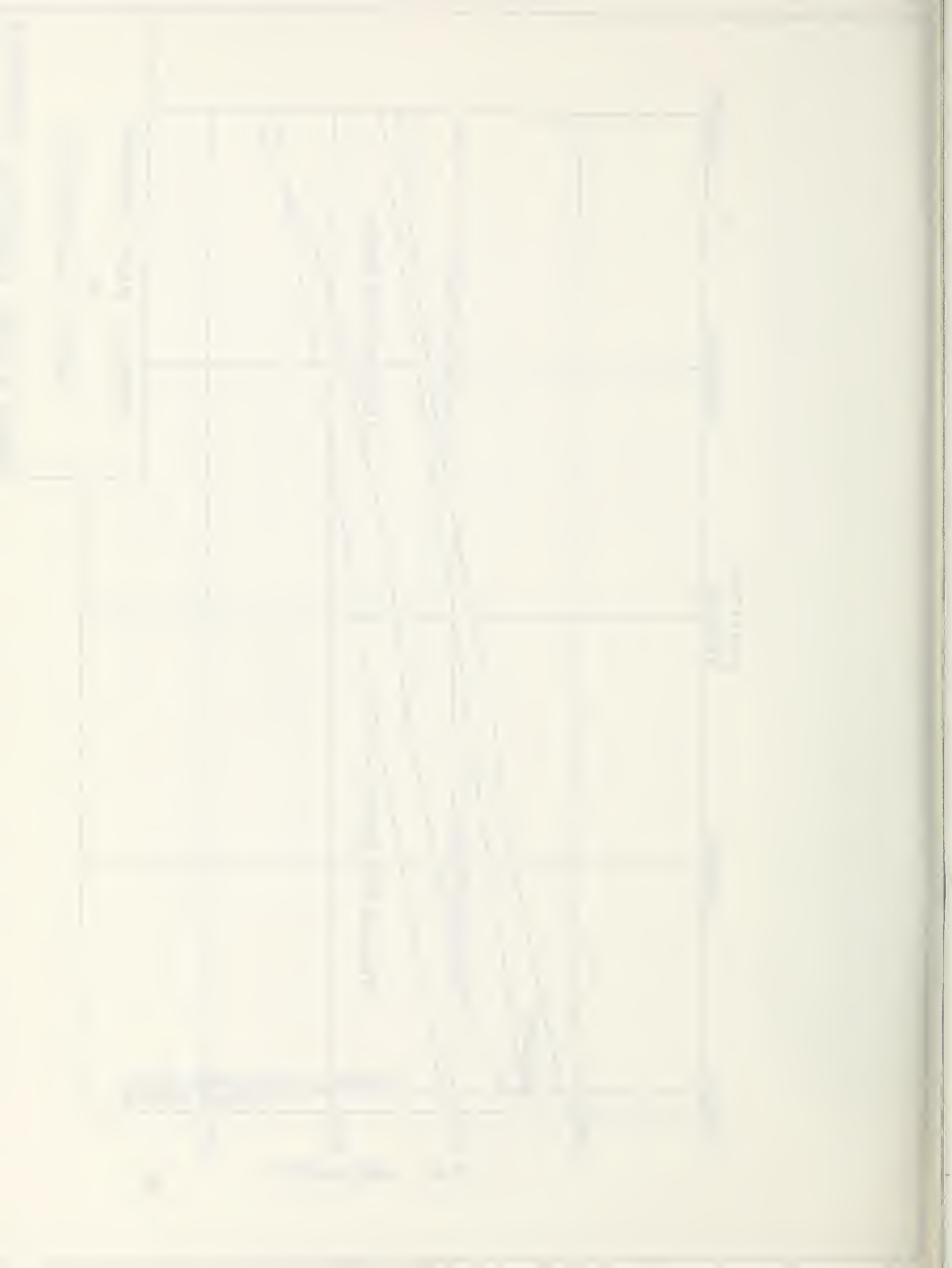
LATITUDE AND LONGITUDE LINES ARE APPROXIMATE

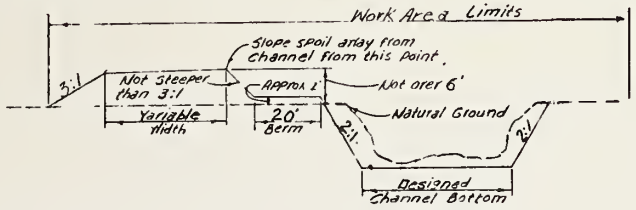
REVISED APRIL 1974 4-R-30866

FORMERLY 2-P-10,970 4-R-25,640

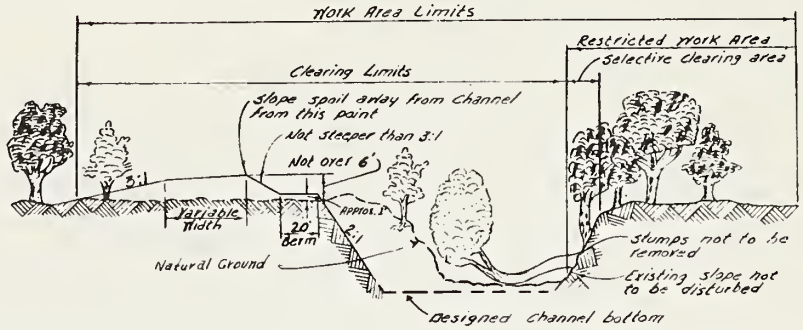


PROFILE MAIN CHANNEL
of
BOGOTA WATERSHED
OBION & DYER COUNTIES, TENNESSEE

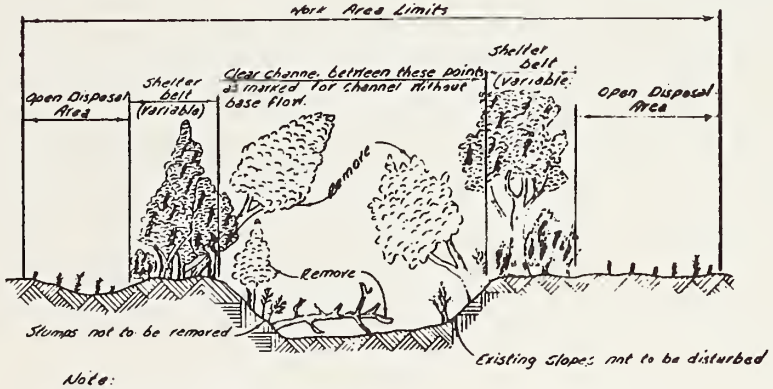




CHANNEL EXCAVATION
(Cleared Area)



CHANNEL EXCAVATION
(Wooded Area)



Note:
Shelter belt clearing will be limited to that which is necessary to provide access to channel.

Disposal areas within extensively wooded reaches of channel clearing will be selected within the work area limits by the engineer

CHANNEL CLEARING NON-EXCAVATED REACHES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TYPICAL SECTIONS
BOGOTA WATERSHED
PORTIONS OF
DYER AND OBION COUNTIES
TENNESSEE